BC hydro

Environmental Impact Assessment Report
Volume One
Analysis

Kelly Lake to Cheekye Substation Second 500 kV Transmission Line

March 1991

Report No. ER-90-05

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91-06911/

Canadian Cataloguing in Publication Data
Main entry under title:

Kelly Lake Substation to Cheekye Substation second 500 kV transmission line environmental impact assessment report

Contents: v. 1. Analysis – v. 2. Resource atlas and impact assessment

"Report no. ER-90-05"
ISBN 0-7726-1112-2

1. Electric lines – Environmental aspects – British Columbia – Squamish-Lillooet. 2. Electric power transmission – Environmental aspects – British Columbia – Squamish-Lillooet. I. B.C. Hydro. Environmental Resources.

TD195.E37K44 1990 333.79'3214'0971133 C90-092112-9

KELLY LAKE TO CHEEKYE SUBSTATION

500kV TRANSMISSION LINE

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

VOLUME ONE ANALYSIS

REPORT NO. ER-90-05

March 1991

B.C. HYDRO
ENVIRONMENTAL RESOURCES DIVISION
CORPORATE AND ENVIRONMENTAL AFFAIRS

B.C. HYDRO

KELLY LAKE TO CHEEKYE SUBSTATION 500 kV TRANSMISSION LINE PROJECT

ENVIRONMENTAL IMPACT ASSESSMENT REPORT

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Environmental Resources

Recommended by:

Approved by:

Date: March 1991

VOLUME ONE

ANALYSIS

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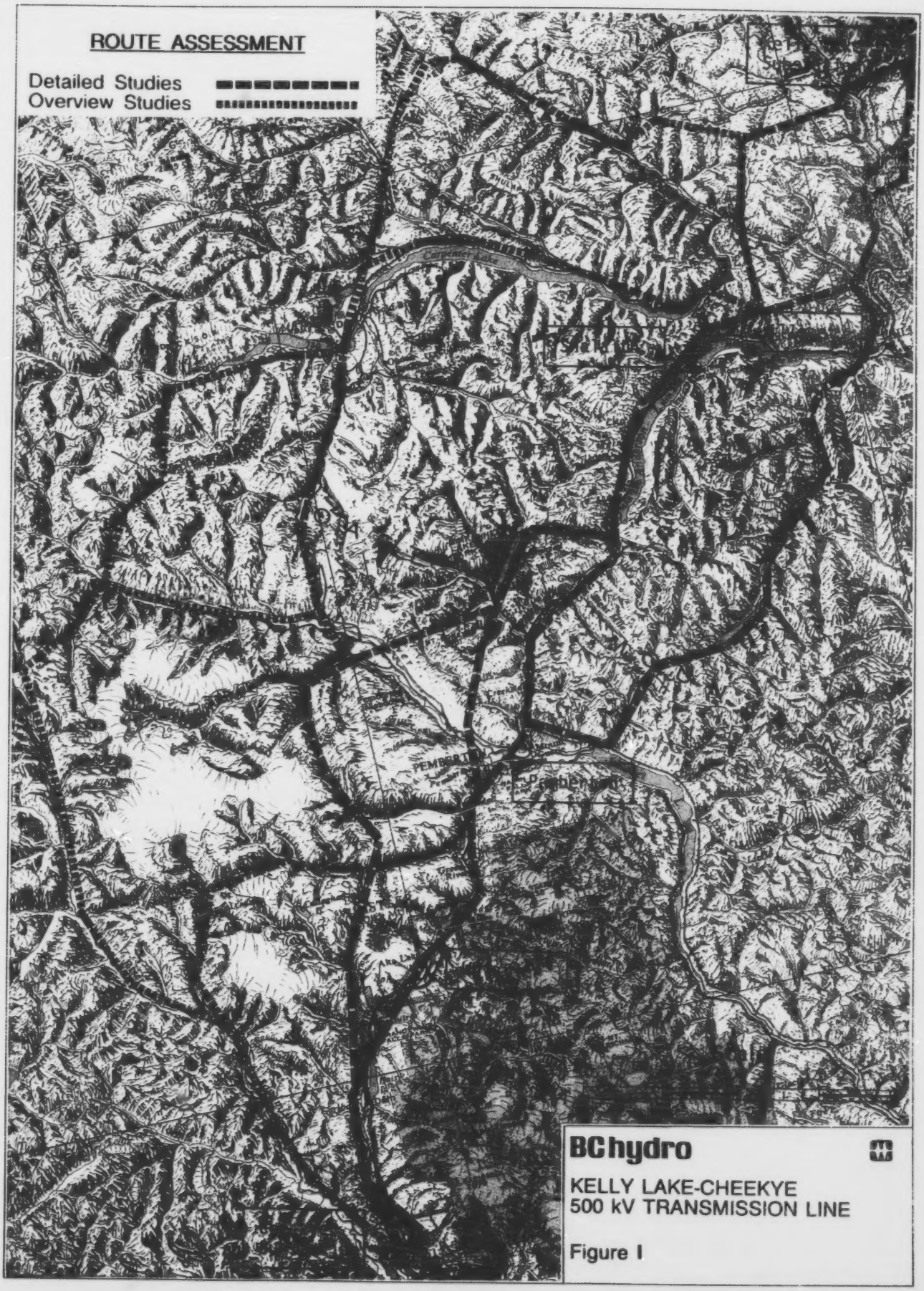
TRANSMISSION LINES REFERENCED

B.C. HYDRO CIRCUIT NUMBER	DESCRIPTION OF TRANSMISSION LINE
2L1	230 kV transmission line, Bridge River Terminal to Cheekye (free standing structures, three single conductors). Structures are steel except for a short length of double wood poles west of Alta Lake.
2L2	230 kV transmission line, Bridge River Terminal to Cheekye (free standing steel structures, three double conductors)
2L90 & 2L91	230 kV transmission line, Bridge River Terminal to Kelly Lake (double wood poles, three single conductors)
3L2	360 kV transmission line, Bridge River Terminal to Rosedale via Lillooet and Harrison Lakes (self-supporting steel towers, three double conductors)
5L41	500 kV transmission line, Kelly Lake to Ingledow (guyed and free standing steel towers, three quadruple conductors)
5L42	500 kV transmission line, Kelly Lake to Cheekye (guyed and free standing steel towers, three quadruple conductors)
5L46	Proposed 500 kV transmission line, Kelly Lake to Cheekye (guyed and free standing steel towers, three quadruple conductors).

ABBREVIATIONS USED

ALR	-	Agriculture Land Reserve
BCR	-	B.C. Railway
CLI	-	Canada Land Inventory
EPC	-	Energy Project Certificate
EHV	-	Extra High Voltage
IPSFC	-	International Pacific Salmon Fisheries Commission
IPP	-	Independent Power Producer
IR	-	Indian Reserve
LTC	-	Lillooet Tribal Council
MOF	-	Ministry of Forests
MOP	-	Ministry of Parks
MOTH	-	Ministry of Transportation and Highways
RMOW	-	Resort Municipality of Whistler
ROW	-	Right of Way
SLRD	-	Squamish Lillooet Regional District
UREP	-	Reserve for Use, Recreation and Enjoyment of Public



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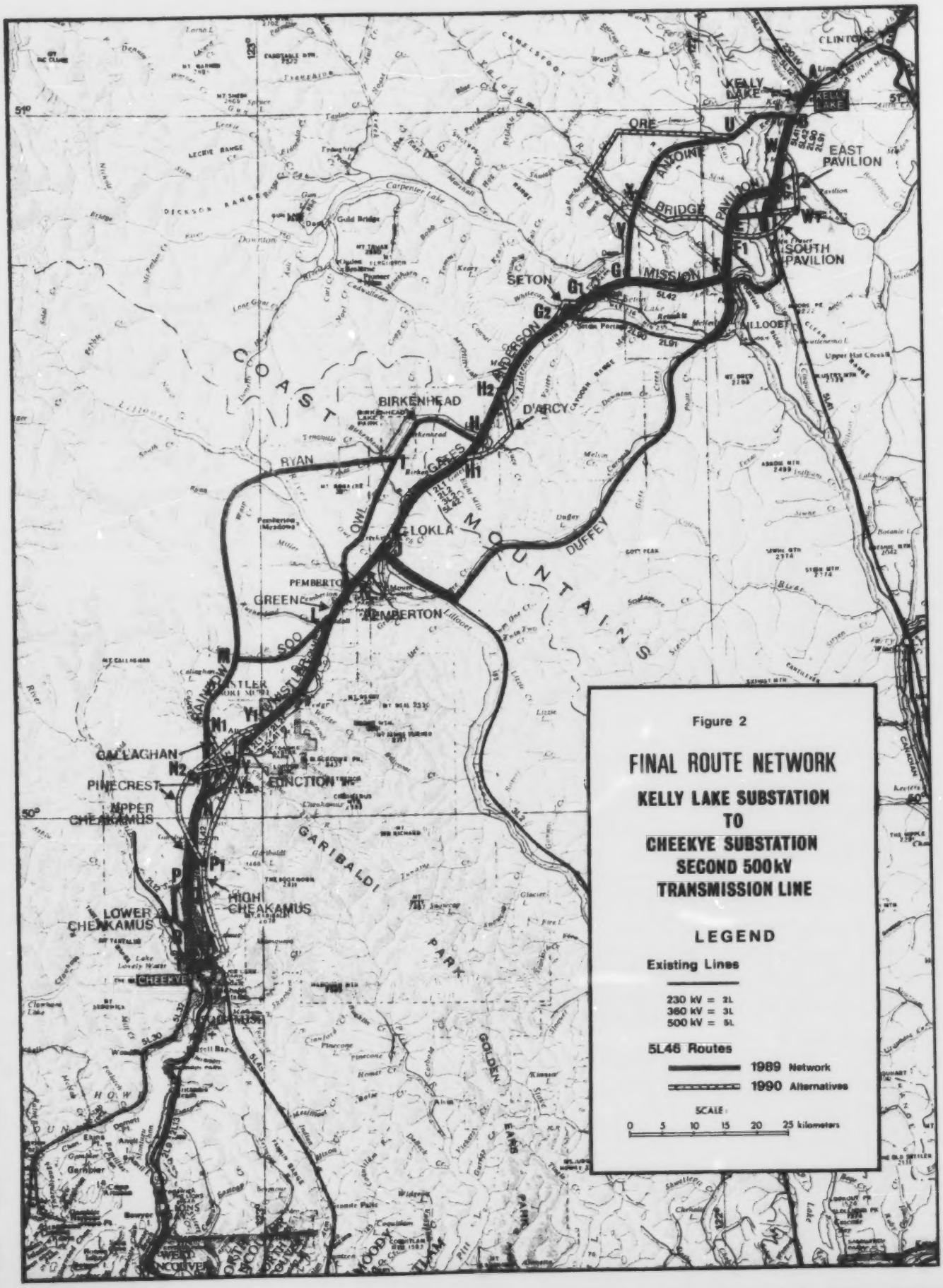
KELLY LAKE-CHEEKYE
500 kV TRANSMISSION LINE

Figure 1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FINAL ROUTE NETWORK
KELLY LAKE SUBSTATION
TO
CHEEKYE SUBSTATION
SECOND 500 kV
TRANSMISSION LINE
LEGEND
Existing Lines
230 kV = 2L
360 kV = 3L
500 kV = 5L
5L46 Routes
1989 Network
1990 Alternatives
SCALE:
0 5 10 15 20 25 kilometers
KELLY LAKE
CLINTON
ORE
ANDOINE
EAST PAVILION
BRIDGE
PAVILION
SOUTH PAVILION
MISSION
SETON
ANDERSON
LILLOOET
BIRKENHEAD
D'ARCY
RYAN
LOWE
LOKLA
DUFFEY
MOUNTAINS
COAST
PEMBERTON
GREEN
SOO
CALLAGHAN
PINECREST
UPPER CHEAKAMUS
LOWER CHEAKAMUS
HIGH CHEAKAMUS
CHEEKYE
GARIBALDI
PARK
GOLDEN EARS
WEST VANCOUVER
VANCOUVER
MOODY
TIAM

1.0 SUMMARY

This report is an account of the environmental work done in preparation for an application to the Minister of Energy, Mines & Petroleum Resources for an Energy Project Certificate for a second 500 kV transmission line (known as 5L46) from Kelly Lake substation, near Clinton to Cheekye substation, near Squamish. In addition, it summarizes the opinions expressed during the first two stages of the public consultation program for the project and integrates the opinions of the public and the environmental consultants to identify what B.C. Hydro believes to be the generally favoured route for the line.

This project was first proposed in 1978 as a single circuit line, then in 1979 it was upgraded to a double circuit 500kV line with a proposed new substation at that time called Creekside, at Spetch Creek, north of Pemberton. A corridor selection study was completed in 1981 which identified the existing corridor, used by transmission line 5L42 from Kelly Lake to Cheekye, as the preferred corridor. This was followed by a second study, completed in 1984, which identified a preferred alignment in that corridor, but by this time the project had been revised to a single circuit line. Because load growth declined, the project was postponed in 1984.

Increasing consumption of electricity in the Lower Mainland and Vancouver Island now requires the capacity of the transmission system to these load centres to be increased, and this project has been identified by B.C. Hydro as the best opportunity to increase that capacity.

The forecast of future electricity demand shows that the second line could be needed by the mid 1990s. Given the time required for regulatory approvals and construction, an Application for an Energy Project Certificate will be submitted in 1991.

The current proposal for 5L46 is to use three bundles of four conductors supported by guyed and self-supporting steel towers, with the bundles of conductors arranged in either delta or flat configuration. Selection of structure configuration is still being reviewed.

The project is about 195km long and is estimated to cost between $220 and $247 million, depending on the final route selected, and timing of construction.

In determining the scope of the current environmental study, B.C. Hydro wanted to start without any preconceptions derived from past environmental and technical studies. A new route network for review was therefore established in 1989, designed to include all technically feasible options. This network was extended in 1990 to include further options identified during the public consultation program, and options which would bypass Indian Reserves and the Antoine Creek Valley.

The route network was examined by an environmental consulting team in 1989 and 1990, including specialists in terrestrial studies (terrain, vegetation, agriculture, forestry, land use), biological studies (wildlife and fish), and social studies (heritage, aesthetics, recreation and social impacts). Each consultant produced a report describing the environmental features in each segment of the route network, the potential impacts of the project on their subject of interest, and provided a comparison of route options. The description of the environmental features and assessment of potential impacts listed by discipline or resource is presented in Volume 2 of this report. Volume 1 of this report presents the major environmental findings and compares the route options.

Referring to the study route network shown in Figure 2, the major environmental issues identified in each segment are:

1989 NETWORK

Kelly Lake:	Erosion on steep terrain, forest loss, heritage sites.
Pavilion:	Agricultural lands on Pavilion Plateau and west side of Fraser River, bighorn sheep range in Fraser Canyon, visual impacts. Heritage sites of high significance on both sides of Fraser River. Requires ROW through Indian Reserves.
Antoine:	Difficult terrain in Cavanagh Creek valley, Fraser Canyon, and Antoine Creek valley. Wildlife impacts in Fraser Canyon, Antoine Creek valley and Bridge River Canyon. Intrusion on community in Antoine Creek valley, loss of wilderness in valley and potential wilderness designation. Heritage sites in Kelly Creek and Fraser Canyon.
Mission:	Forest losses, and terrain disturbance in alpine areas. Requires ROW through Indian Reserve.
Duffey:	Visual impacts near Lillooet, in Seton River valley, Cayoosh Canyon, at Duffey and Joffre Lakes, and in Mount Currie IR6. Terrain impacts in Cayoosh Canyon. Wildlife and forestry impacts. Requires ROW through Indian Reserves.
Anderson:	Terrain impacts, water quality for domestic supplies. Requires ROW through Indian Reserves.
Birkenhead:	Traverse of Birkenhead Lake Provincial Park. Visual and terrain impacts at Birkenhead Lake.
Gates:	Visual impact, water quality in Gates River, land use in Birkenhead River valley.
Owl:	Visual, terrain and wildlife impacts of traversing proposed Mount Ronayne Recreation Area. Visual and agricultural impacts in Pemberton valley. Impact on Nairn Falls Provincial Park.
Ryan:	Greatest penetration into wilderness in proposed Mount Ronayne Recreation Area, and at Ryan/ Rutherford divide. Visual and agricultural impacts in Pemberton Valley. Severe terrain problems in tributary valley to Ryan River. Impacts on mountain goat and grizzly bear in Ryan River drainage.
Pemberton:	Agricultural and visual impact in Pemberton valley. Impact on Nairn Falls Provincial Park.
Green:	Loss of productive forest land.
Soo:	Loss of productive forest land, visual impacts in Green River valley, loss of natural character in Soo River valley.
Whistler:	Visual impacts of new and existing lines, effects on wetlands. Impact on Brandywine Falls Provincial Park.
Rainbow:	Terrain, visual and recreation impacts in Rainbow Pass, land use and forestry impacts in Callaghan River valley.

Upper Cheakamus:	Visual impact.
Lower Cheakamus:	Visual impact, land use, heritage site.

1990 ADDITIONS

Ore:	Loss of productive forest land, wildlife impacts, visual and land use impacts in Yalakom River valley. Heritage site.
Bridge:	Visual impacts in Bridge River valley, wildlife impacts, terrain impacts in Bridge River and Applespring Creek valleys, land use impacts near mouth of Antoine Creek.
East Pavilion:	Visual impacts in Pavilion Creek valley and Fraser Canyon as a result of highway and transmission line crossing.
South Pavilion:	Wildlife, and visual concerns in Fraser Canyon, terrain impacts on both sides of Fraser River.
Seton sub-option:	Terrain impacts on higher, steep slopes, visual concerns.
D 'Arcy sub-option:	Severe visual impact of Anderson Lake crossing. Land use restrictions near D'Arcy.
Lokla sub-option:	Visual impact along highway.
Function sub-option:	Visual concerns at south entrance to Whistler.
Callaghan:	Visual and land use impacts. Loss of productive forest land.
High Cheakamus:	Visual impact. Loss of productive forest land. Crossing of Rubble Creek extension to Garibaldi Provincial Park.
Pinecrest:	Visual impact from Highway 99, land use on Cheakamus River valley floor, recreation impacts at Shadow Lake.
Pinecrest East sub-option:	Visual impact at crossing of Highway 99 and 2L2.

Many opinions identified in the public consultation program helped in the analysis of route options. They were:

(a) **Support for use of existing corridor**

- Squamish Lillooet Regional District, Outdoor Recreation Council, Federation of BC Naturalists, Federation of Mountain Clubs, BC Wildlife Federation, Yalakom Community Council.

(b) **Pavilion Route preferred to Antoine Route**

- Lillooet residents, Yalakom Community Council, outdoor groups as in (a).

(c) **Anderson Route preferred to Duffey Route**

- Squamish Lillooet Regional District, Village of Lillooet, Mount Currie Indian Band, outdoor groups mentioned in (a) and the residents of Lillooet and Pemberton who were involved in the public consultation program.

Analysis of the route network reviewed in 1989 was done through a process of successive reduction by comparing the alternative routes and rejecting the options with greatest impacts and/or conflicts with public opinion. Ten comparisons were sufficient to reduce the 1989 network to a single route. For this project the route favoured by the expressed public opinion matches the consensus route of the environmental consultants.

The ten comparisons, and results, are as follows, again referring to Figure 2:

(1) Fraser crossings option, reject southern option.

(2) Antoine versus Pavilion/Mission, reject former.

(3) Duffey versus Mission/Anderson/Gates, reject former.

(4) Antoine/Anderson/Gates versus Pavilion/Duffey, reject latter.

(5) Birkenhead/Owl versus Gates/Pemberton, reject former.

(6) Birkenhead/Ryan/Rainbow versus Gates/Pemberton/Green/Whistler, reject former.

(7) Soo/Rainbow versus Whistler, environmental consultants, SLRD and outdoor groups favour latter, firm public opinion has not been identified at Whistler.

(8) Lower Cheakamus, West versus Valley, reject former.

(9) Lower Cheakamus, South versus Valley, reject latter.

(10) Lower Cheakamus, East versus Valley, reject former.

The generally favoured route that emerged as a result is shown below. This route was described in a May 1990 project Newsletter distributed to households in the study area. It was further described in six Open Houses held in June 1990 in communities along the route.

AB	Kelly Lake
BCEF	Pavilion
FG	Mission
GH	Anderson
HJ	Gates
JK	Pemberton
KL	Green
LN	Whistler
NP	Upper Cheakamus
PQRST	Lower Cheakamus

However, this route was still tentative as no formal opinion had been expressed by the Pavilion, Bridge River, Seton Lake, and Anderson Lake Indian Bands who would have to agree to new ROW agreements to allow the route to be used. In addition, the Resort Municipality of Whistler, and the Whistler community, had not yet reached a formal opinion on routing of the project at Whistler, and residents of the lower Cheakamus valley preferred an option that stays away from their properties.

During the first phase of the public consultation program, a suggestion was made to evaluate a route in Whistler, at Function Junction, and B.C. Hydro proposed to review a new route on the east side of Cheakamus River Valley, to be called High Cheakamus. This was done prior to the second phase of public consultation.

Consultation with Indian Bands was attempted in the first phase but achieved little other than to secure the opinion of the Mount Currie Band on the Duffey route. The other Bands chose not to comment on the route options, but did not register objections to the generally favoured route. Consultation with the Bands continued in the second phase and the opinion of the Anderson Lake Band on routing at D'Arcy was obtained. Negotiation with the Pavilion, Bridge River, and Seton Lake Bands continues through the medium of the Lillooet Tribal Council. As no agreement had been reached with the Bands whose reserves would be crossed by the generally favoured route B.C. Hydro identified possible bypass routes to the reserves and these were examined in 1990 and discussed in the second phase of public consultation.

The studies done in 1990 and the second phase of public consultation lead to the following conclusions:

(1) The Antoine Creek community can only be avoided by use of the existing corridor which crosses Bridge River IR1 or by use of either of the Ore and Bridge segments. Use of the Ore and Bridge segments is considered unacceptable by the community in the Yalakom River valley which strongly prefers use of the existing corridor. It is the opinion of the environmental consultants that use of the Bridge segment would have lower overall impact than use of the Ore or Antoine segments.

(2) Pavilion IR1 can be circumvented by use of the Antoine or Antoine/Ore segments, or by use of the East or South Pavilion segments. Of these, the East Pavilion option could have the least environmental impacts.

(3) Bridge River IR1 can only be bypassed by use of the Antoine, Antoine/Ore, and Pavilion/Bridge/Antoine routes. Of these the Pavilion/Bridge/Antoine route would have lowest environmental impacts, but these would be considerably higher than those resulting from use of the existing corridor.

(4) Pavilion IR and the Antoine valley can be bypassed by use of the Antoine/Ore, the East Pavilion/Bridge/Antoine, or the East Pavilion/Pavilion/Mission routes; the latter is considered to have the least environmental impact potential.

(5) The Antoine valley, Pavilion IR, and Bridge River IR can only be avoided by use of the Antoine/Ore or the East Pavilion/Bridge/Antoine routes. Both of these have high impact potential, but the latter is considered to be less adverse.

(6) The Seton sub-option has higher terrain impacts than the existing Anderson segment due to its greater steepness

(7) The D'Arcy sub-option has very high adverse visual impact potential and would impose land use restraint on the east side of D'Arcy. It is much less favourable than use of the existing corridor. The Anderson Lake Band concur with this view and is prepared to negotiate a new ROW for the project.

(8) The Lokla sub-option would have higher visual impact along the highway than use of the existing 2L1 ROW, but the level of impact is considered to be acceptable.

(9) The Function sub-option is considered an improvement in visual and land use terms as compared to the route adjacent to 5L42.

(10) The High Cheakamus segment can be constructed within acceptable levels of environmental impact. It would have a lower visual impact than use of a route through the Upper and Lower Cheakamus segments, and would present fewer long term conflicts for land use. However, the immediate impacts of its construction would be greater than for a route through the Upper and Lower Cheakamus segments. In the long term, it is preferable from a land use and visual point of view. This option is highly preferred by residents of the Lower Cheakamus valley.

(11) If the Soo/Rainbow segments to bypass Whistler, and the High Cheakamus segment are used, then the Callaghan segment represents an environmentally acceptable connection between them.

(12) The Pinecrest East option, adjacent to 5L42 for much of its length was considered preferable to the Pinecrest North option.

(13) The Pinecrest option was considered less attractive than the northern part of the High Cheakamus route for visual and land use reasons.

As a result of the studies done in 1990 and the second phase of public consultation the generally favoured route was adjusted to include the Function option and High Cheakamus route. The D'Arcy and Pinecrest options were dropped.

This report concludes with a description of environmental management plans for construction of 5L46 along the generally favoured route identified at the end of the second phase of public consultation, together with the removal of 2L1.

This final chapter discusses mitigation proposals raised by the environmental consultants and others.

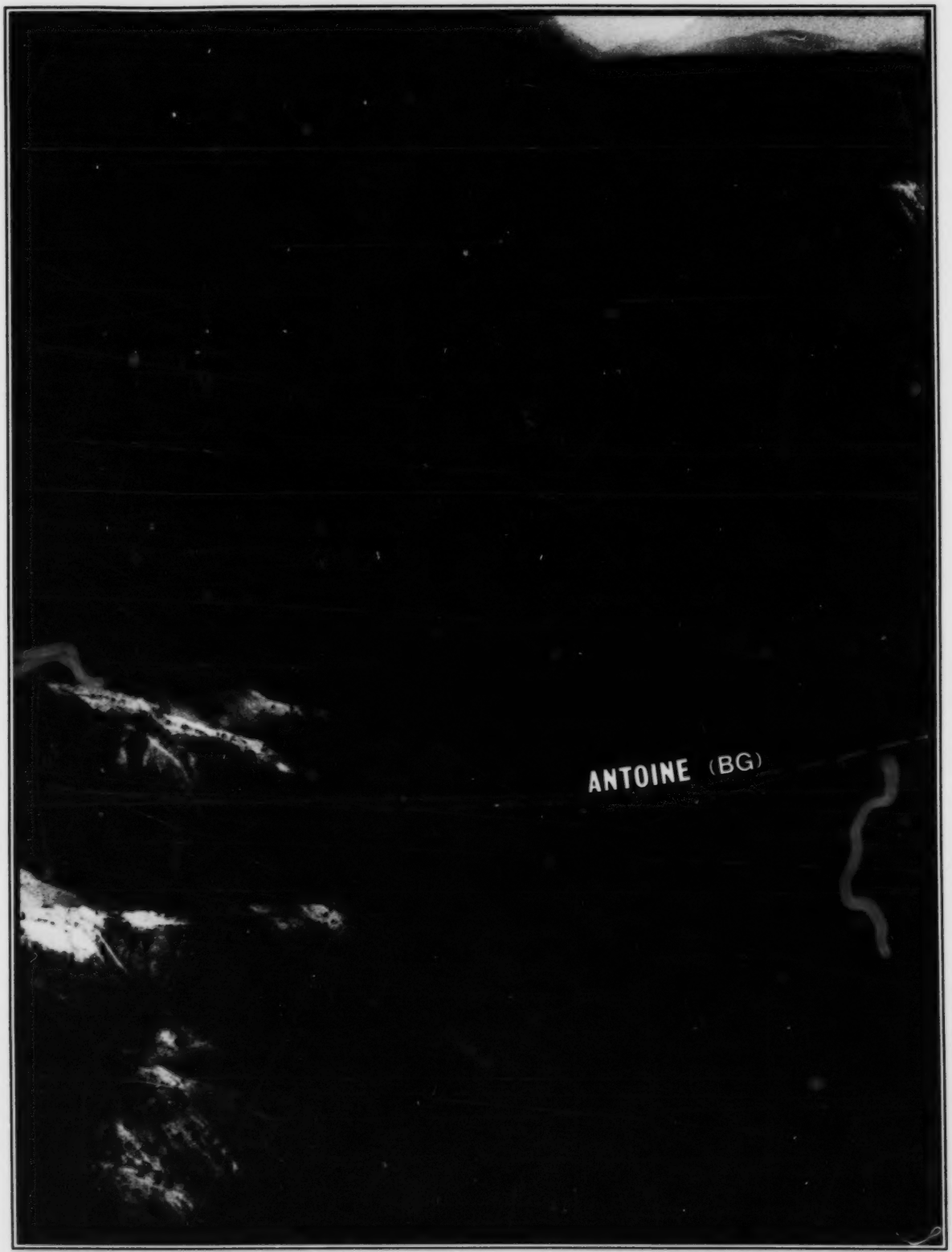


PHOTO 1: Looking south at the Antoine (BG) segment Fraser River crossing. Cavanagh Creek is in the gully on the left. The lower slopes are important winter range for bighorn sheep. Terrain on the left bank is very difficult. High visual impact would occur.

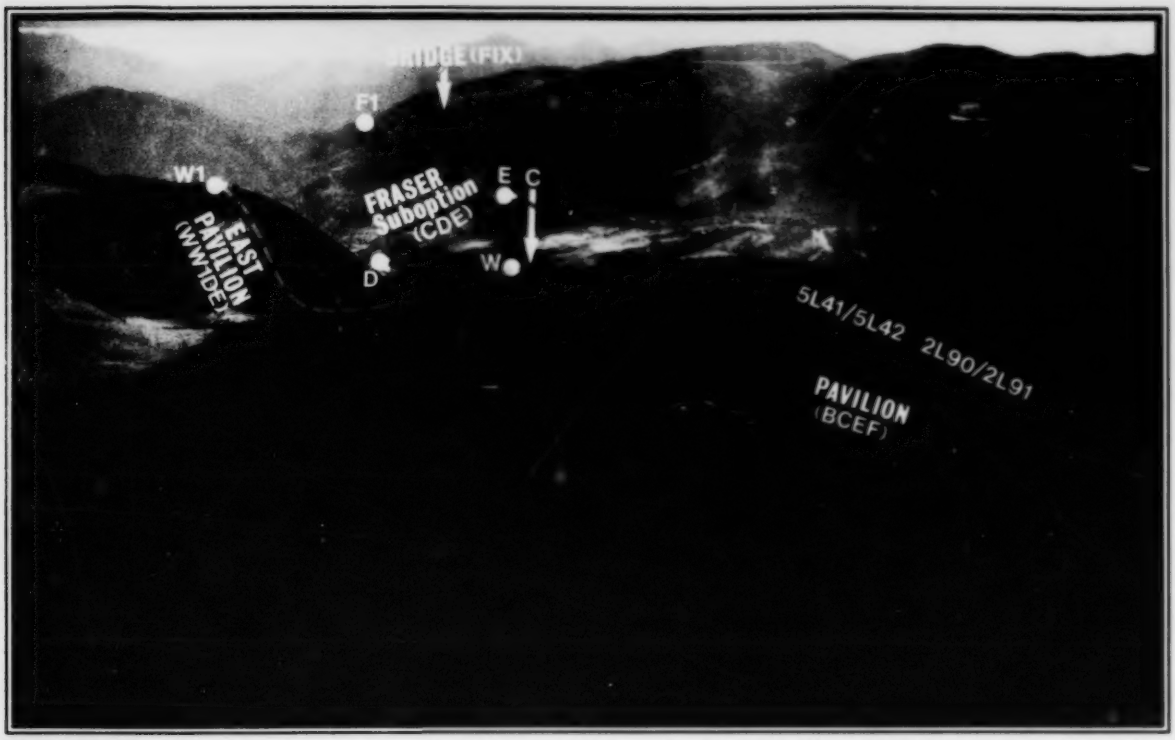


PHOTO 2: View south-west over the Diamond S Ranch. The Pavilion (BCEF) segment is on the unused ROW east of the existing lines. The East Pavilion (WW1DE) segment, Fraser (CDE) suboption and Bridge (F1X) segment are in the background.

PHOTO 3: Looking south along 5L42 to Node F1 at the start of the Bridge (F1X) segment which is well concealed from view from the highway (below).

PHOTO 4: Looking north to the Bridge (F1X) segment on the south facing slopes of the Camelsfoot Range. Severe visual impact potential exists in this section.

PHOTO 5: View south-east along the Yalakom River valley from near the mouth of Ore Creek. The ROW parallels the road near areas of settlement and would be highly visible.

PHOTO 6: Looking north at the route alternatives above Seton Portage at Seton Lake IR 5A. The Seton suboption of the Anderson (GH) segment would involve development of new access to higher terrain.

PHOTO 7: View north from the main street in Lillooet 5L46 would be visible above 2L90/2L91.

PHOTO 8: Looking downstream in Cayoosh Canyon from the Copper Creek bridge. Visual impacts would be very high in this setting along the Duffey (FJ) segment (east of the creek outside the photo).

PHOTO 9: Looking north-west from the head of Lillooet Lake over Mount Currie IR6. High visual impacts would occur at the new village (centre) adjacent to 3L2.

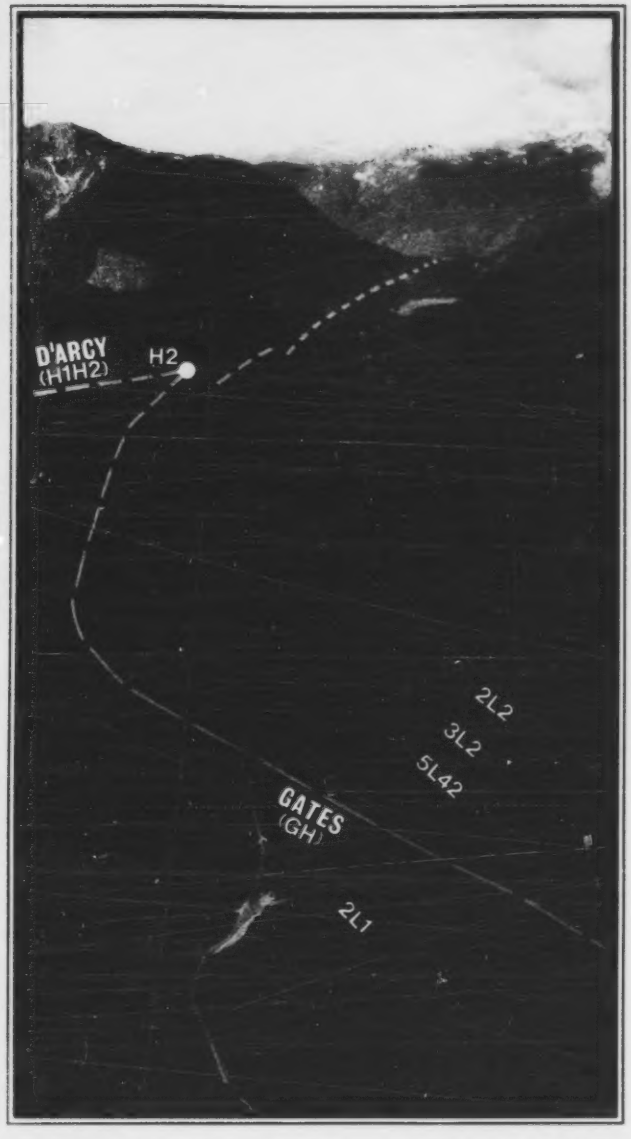


PHOTO 10: Looking south-west in the Gates River valley from near D'Arcy. The route departs from adjacent to 5L42 (foreground) to descend to the 2L1 ROW. After crossing the road it ascends to a new high level route on the south side of the valley thereby abandoning the 2L1 ROW on the valley floor.

PHOTO 11: View west over Gates lake. The route is adjacent to 5L42; the removal of 2L1 along the shore would considerably reduce visual impacts.

PHOTO 12: View north along Highway 99 near the entrance to Nairn Falls Provincial Park; 2L1 (foreground) would be removed and the route would be adjacent to 5L42 behind Signal Hill (background).

PHOTO 13: View south into Rainbow Pass from the Soo River. The Soo (LM) and Ryan (IM) segments meet on the hillside south of the river (node M) from where the Rainbow (MN) segment continues south.

PHOTO 14: View north-east across Green Lake. The Whistler (LN) segment descends from adjacent to 5L42 to the 2L1 ROW; 2L1 would be removed throughout this area.

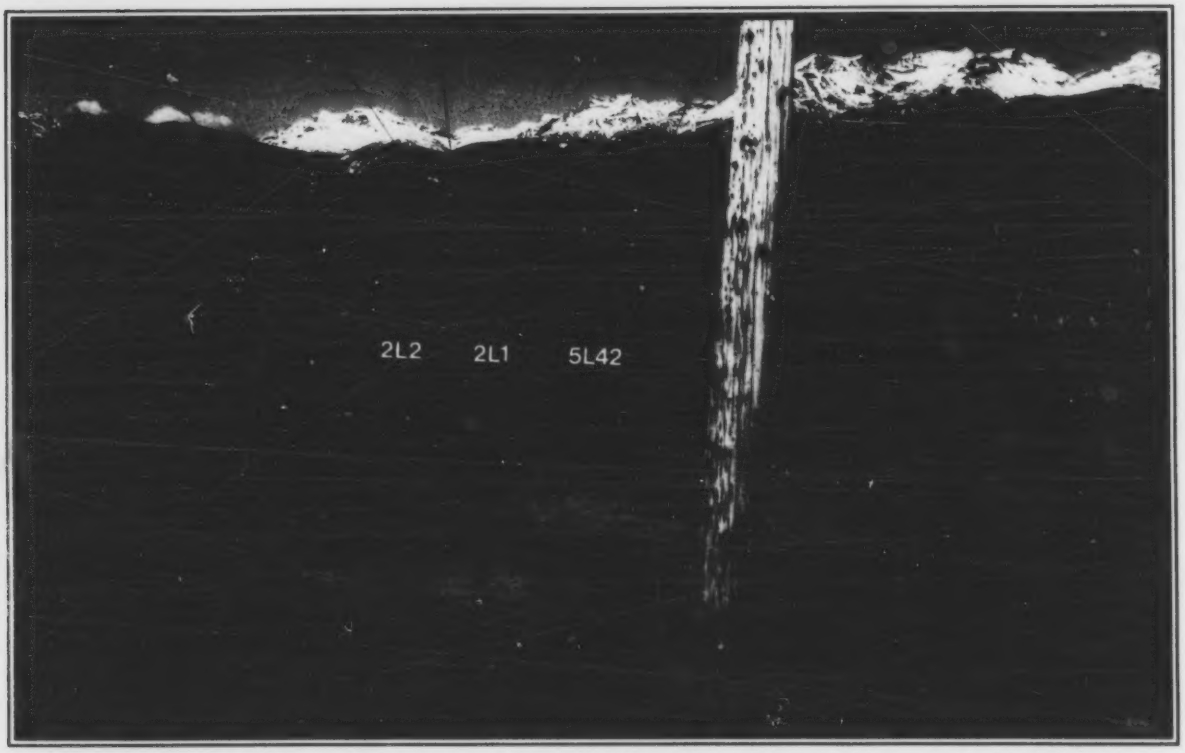


PHOTO 15: Looking north-east over the wetlands at the north end of Alta Lake (right); 5L46 would replace 2L1 (center).

PHOTO 16: Looking south through Whistler where 5L46 would replace 2L1 to the south end of Alta Lake.

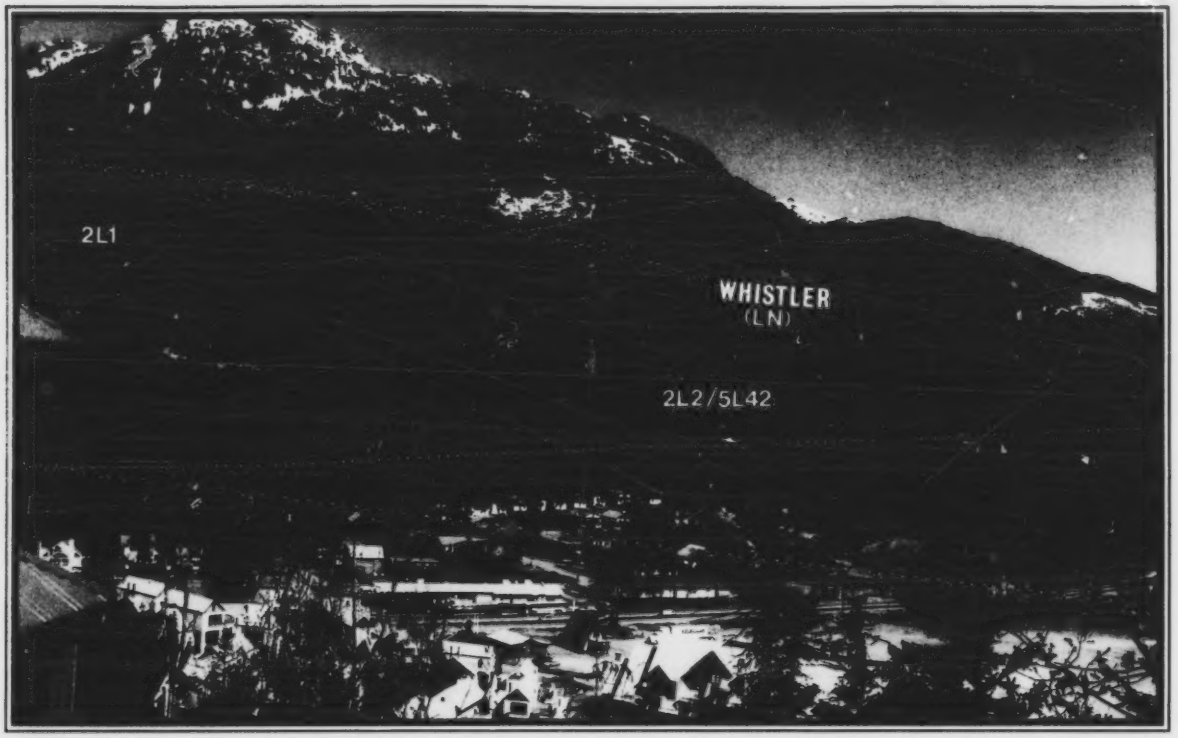


PHOTO 17: View north-west across the valley from the residential area south of Whistler Creek; 2L1 is less exposed than 2L2 and 5L42. The route is above 2L1 and would be partially shielded by a knoll.

PHOTO 18: Looking north-east at Function Junction. The Function suboption would reduce the visual impact at the entrance to Whistler and impose fewer land use restrictions.

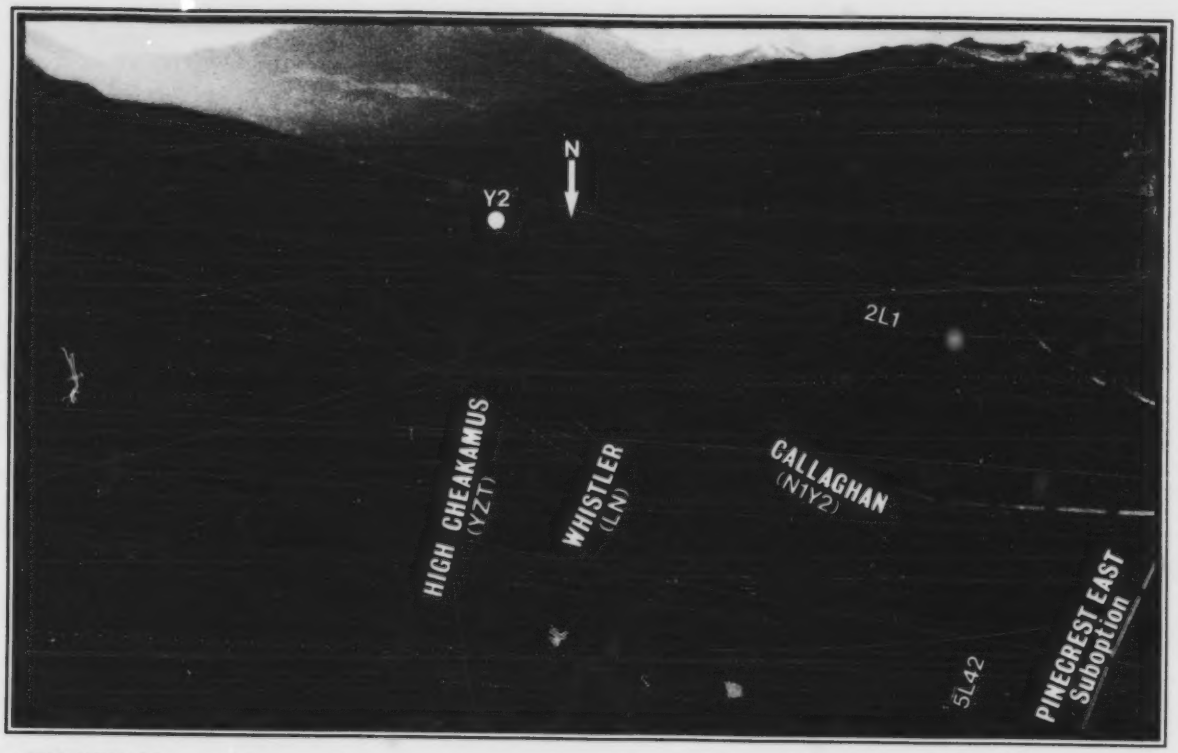


PHOTO 19: Looking south over uplands north-east of Brandywine Provincial Park; 5L46 would be located over cut-blocks on either the Whistler (LN) or High Cheakamus (YZT) segments.

PHOTO 20: Looking north along Highway 99 at the head of Cheakamus canyon. If this route is used, 2L1 would be removed from this visually congested area.

PHOTO 21: View south-west towards the Tantalus Range from the popular viewpoint on Highway 99 which would be very sensitive to visual disturbance. Section PQ of the Lower Cheakamus (PQRT) segment would be barely visible, while the west (PR) suboption would have severe visual impact.

2.0 INTRODUCTION

2.1 STUDY OBJECTIVES

This report presents the environmental work completed for this project and a summary of findings from the public consultation program that is relevant to its environmental aspects. It is in two volumes, (Vol 1 - Environmental Impact Assessment Report and Vol 2 - Resource Atlas and Impact Assessment). The two volumes should be considered together; Volume 2 gives the technical environmental background information for discussion of the project and Volume 1 presents the analysis and recommendations resulting from the environmental studies.

This study was undertaken as the environmental component of B.C. Hydro's preparation for an application for an Energy Project Certificate, under the terms of the B.C. Utilities Commission Act, for the construction of a second 500 kV transmission line from Kelly Lake substation to Cheekye substation. The technical and economic aspects of the project are addressed in other reports. The public consultation report and project justification reports are available separately.

The study objectives for the environmental work were:

(1) To establish a route network for review.

(2) To identify and evaluate environmental features of each segment of the route network.

(3) To participate in public consultation.

(4) To assess impacts of project construction and operation in each segment of the route network.

(5) To analyze the network to determine favourable routes for the project, taking into account environmental factors and the information and route suggestions gathered through the public consultation program.

(6) To establish a prescription for management of construction and operation of the project on a favoured route.

(7) To identify appropriate measures to mitigate adverse environmental and social impacts of the project.

(8) To produce a report describing the work done and conclusions reached to supplement B.C. Hydro's Application for an Energy Project Certificate for the project.

2.2 BACKGROUND TO STUDY

In 1979 B.C. Hydro proposed construction of a double circuit 500 kV transmission line from Kelly Lake substation to Cheekye substation with an intermediate substation at Creekside. SIGMA Resource Consultants were engaged to undertake an environmental study leading to the definition of a preferred corridor for the proposed transmission line as required by the Stage I level of the 'Guidelines for Linear Development' issued by the B.C. Environment and Land Use Committee (ELUC). The study was managed by K.G. Farquharson, P.Eng.

SIGMA's report was issued in April, 1981, and concluded that the corridor following the existing 5L42 and 2L1 transmission lines was the preferred choice. This corridor was also preferred by B.C. Hydro for technical and economic reasons. In September 1980, the B.C. Government changed its procedure for review of major energy projects, such as 500 kV transmission lines, by introducing the Utilities Commission Act and its associated regulations. This act superseded the 'Guidelines for Linear Development' and established its own list of information requirements under the Energy Project Review Process. By December 1981 load growth rates had dropped, and in 1982 B.C. Hydro decided that a double circuit line was no longer required, so the project was reduced to a single circuit line.

B.C. Hydro then approached K.G. Farquharson, principal of Cypress Resource Consultants, to undertake the necessary environmental and social impact studies to meet the requirements of an Application for an Energy Project Certificate under the terms of the Utilities Commission Act. The Cypress report addressed the identification of a preferred alignment within the existing corridor recommended by the SIGMA study. The report was completed in April 1984 but was not issued by B.C. Hydro, because load growth had declined further and the project was deferred.

By 1989 load growth had risen and B.C. Hydro reactivated the project on a single circuit basis. In February 1989 K.G. Farquharson was engaged as environmental coordinator for the project, working from the offices of the Environmental Resources Division of B.C. Hydro, and was able to retain most of the original consultants who had worked on the earlier studies to provide continuity in the work. As a result of current policy B.C. Hydro decided to enlarge the scope of the environmental studies to cover a larger route network than that reviewed from 1981 to 1984.

B.C. Hydro initiated the field studies and public consultation for the re-activated project in summer 1989 and at the same time released the Cypress Report as an information document. As a result of the public consultation program and in recognition of the sensitive nature of native issues in British Columbia, B.C. Hydro extended the route network under review in 1990 to include routing options proposed by the public and consideration of routes that bypassed reserves.

2.3 TERMS OF REFERENCE

The terms of reference for the 1981-84 study were prepared jointly by B.C. Hydro and Cypress and were submitted for review to the Energy Project Coordinating Committee of the B.C. Government in 1982 and modified, where appropriate, to incorporate their concerns.

The same terms of reference were used as the basis for the work of this study which is seen as an extension and update of the work done from 1981 to 1984. The objective was to cover an extended route network to approximately the same level of detail as the 1981-1984 work. The extended terms of reference were again shown to the Energy Project Coordinating Committee, and accepted.

It should be recognized that B.C. Hydro, or its agents, have no access to Indian Reserve land without the permission of the Band. As of February 1991, the various Bands involved in the study area have not given permission for the consultants to enter reserve land. The work of the consultants with regard to reserve lands has therefore been limited to interpretation of aerial photographs; observation from roads, highways, and helicopters, and study of adjacent lands. This has permitted identification of the characteristics of reserve lands for environmental assessment but has not permitted a site specific heritage survey, nor definition of each Band's intent as to future use and management of its lands. (Note: As of mid-March 1991, B.C. Hydro's land use and socio-economic consultant was able to initiate discussions with various bands).

During B.C. Hydro's public consultation program for this project many queries were raised on the effects on human health from electric and magnetic fields. This complex subject is addressed separately by B.C. Hydro.

2.4 STUDY TEAM

The study team was composed of the following individuals:

K.G. FARQUHARSON, P.Eng.	Study coordination	
P.A. CHRISTIE, P.Ag., R.P. Bio.	Terrain; agriculture	Talisman Land Resource Consultants (Vancouver)
J. STANDISH, P.Ag., RPF	Forestry, vegetation	Stewart and Ewing Ltd. (Richmond)
W. BIGGS, P.Ag., R.P. Bio.	Wildlife	Westland Resource Group (Victoria)
D. BENN, B.S.F., R.P. Bio.	Recreation; aesthetics	Juan de Fuca Environmental Consultants (Victoria)
J. BUSSEY, B.A., M.A., (archaeology)	Heritage resources	Points West Heritage Consulting Ltd. (Langley)
G. SMITH, R.P. Bio.	Aquatic resources	Hatfield Consulting Ltd. (West Vancouver)
G. PETERSON, MCIP	Land use and socio-economic impacts	Urban Systems Ltd., (Kamloops)

Of this team all had worked on the 1981-84 study except for Messrs. Benn, Smith, and Peterson and were thus well acquainted with the study area.

The following consultant reports were prepared for the project and have provided the basis for this report. They are:

(1) Talisman Land Resources Consultants, Kelly Lake/Cheekye 500 kV Transmission Line Resource Assessments (Terrain, Agriculture, Vegetation, Forestry, Wildlife)

(2) Juan De Fuca Environmental Consultants, Recreation and Visual Assessments, Kelly Lake-Cheekye 500 kV Transmission Line

(3) Points West Heritage Consulting Ltd., Heritage Resource Update: Proposed Kelly Lake/Cheekye 500 KV Transmission Line

(4) Hatfield Consultants Ltd., Fisheries Values and Potential Construction Impacts of Kelly Lake-Cheekye Transmission Project

(5) Urban Systems Ltd., Kelly Lake-Cheekye 500 kV Transmission Line Environmental Studies - Land Use/Socio Economic Component

2.5 ACKNOWLEDGEMENTS

Contact with numerous staff members of provincial, federal, regional and municipal government agencies was made by the consultants during the study. The study team greatly appreciated the assistance they provided.

The public consultation program allowed many members of the public to bring forward concerns, questions, suggestions and ideas. The contribution of the public has been integrated with that of the study team and has assisted in creating a more comprehensive review.

3.0 METHODOLOGY

3.1 EVOLUTION OF ROUTE NETWORK

This project has a long history, but one basic fact has remained constant: namely that there are only a few routes through the Coast Mountains between Kelly Lake and Cheekye that are feasible for transmission line development from a technical point of view or in terms of land use.

The major restraints defining the area within which a route must be found are:

- Garibaldi Provincial Park. The Nature Conservancy designation of the western part of the park prohibits traverse by a transmission line. This fixes the southeast boundary of the study area, as a route down the east side of Garibaldi Park cannot achieve the objective of reaching Cheekye. The Rubble Creek extension to Garibaldi Provincial Park does not have a nature conservancy designation.

- The Cayoosh Creek/Duffey Lake Valley becomes the effective eastern boundary for the study area because the next feasible route to the east is the Fraser Canyon which does not lead to the desired destination at Cheekye.

- The Lillooet Ice Field, the Coast Mountain barrier at the head of Jervis Inlet, and the Tantalus Range create an effective western limit to possible routes. They determine that the valleys of the Elaho and Squamish Rivers form the western limit for a feasible route.

- The Pemberton Icecap, between Rutherford Creek and the Elaho River, is an effective barrier to transmission lines. It determines that the only feasible route lying between the Elaho and Green river valleys is by way of the valleys of Ryan and Rutherford creeks.

Taking these restraints into consideration the route network which was initially defined is shown in Figure 1. This network satisfies B.C. Hydro's criteria for study of transmission line routes in that:

- The network is extended beyond existing corridors.

- All feasible routes are included other than those prohibited by land use designation such as a Nature Conservancy under the Park Act, regardless of land ownership.

- A possible bypass is identified for each community, the reserve bypasses were not part of initial route network.

On the assumption that the environmental impact of a transmission line is approximately in direct proportion to its length, a decision was made after the first phase of consultation to eliminate those routes which were 20% or more longer than the existing corridor as shown in Table 3-1. Given that all the longer western routes were through areas where no road access has yet been developed, and as provision of road access is a major factor in creation of environmental impact, it is certain that the longer routes would have a higher than average environment impact. All routes shown in red in Figure 1 were therefore dropped from further consideration as they were more than 20% longer than the existing corridor alternate, resulting in the reduced route network shown in red on Figure 2. This network became the base for further environmental and technical study.

As a result of the public consultation program the sub options shown in the lower Cheakamus area were added to the network in 1989 and reviewed during that year.

The segments and sub-options shown on Fig. 2 by dashed red lines were added and reviewed in 1990. these included bypasses to all Indian Reserves.

TABLE 3-1

COMPARISON OF LENGTHS OF POSSIBLE ROUTES

			Increment
A.	Total Project	Length (km)	over base (%)
	Existing corridor - Base for comparison	192	0
	Yalakom - Pebble - Elaho	263	37
	Yalakom - Hurley - Lillooet - Elaho	283	47
	Yalakom - Hurley - Ryan	237	23
	Carpenter - Pebble - Elaho	264	38
	Carpenter - Hurley - Lillooet - Elaho	284	48
	Carpenter - Hurley - Ryan	238	24
	Duffey	201	4
	Birkenhead - Owl	199	4
	Birkenhead - Ryan	215	12
B.	Southern Portion		
	Existing corridor	65	0
	Soo - Squamish	96	48
	Soo - Rainbow	72	11

3.2 ENVIRONMENTAL WORK SEQUENCE

The work has followed a logical sequence. For ease of reference the segments of the initial route network were defined by labelling the nodes alphabetically in the network and by allocating a name to each segment. Later segments are identified by assigning numbers or letters to the new nodes, and some simple sub-options are identified (eg. W1F1) solely by a name to reduce the number of nodes requiring identification.

To assess the potential impacts of a transmission line where terrain, land use and ownership are as varied as that of the project area, it is essential to have a good understanding of the probable alignment of the transmission line in each segment.

For those segments within the existing Kelly Lake-Cheekye transmission line corridor the alignment selected for initial study was that of the preferred alignment identified in the 1984 Cypress study. For those segments not within the existing corridor, the alignment for study was defined after discussion and agreement between project technical staff and the environmental coordinator. The alignments were plotted on 1:50,000 base maps and issued to the environmental consultants. In the existing corridor, care was taken to differentiate areas where the alignment used an existing ROW, required a new ROW adjacent to an

existing transmission line, or required new ROW away from any existing transmission line, so as to assist assessment of impacts.

In August 1989, B.C. Hydro commissioned new aerial colour photography of all segments of the network at a scale of 1:10,000 and black and white photography at a scale of 1:25,000 to assist the consultants, technical staff, and future surveys.

The consultants were briefed on the project, and informed of the material available to assist them in June 1989, and proceeded to organize their field work. A meeting of all the environmental consultants occurred in September 1989. Each consultant described the work done, the issues identified, and indicated their preliminary assessment of potential impacts. This briefing allowed the project team and environmental coordinator to be fully informed on environmental issues prior to the eight Open Houses held in October 1989 as part of the public consultation program. The environmental consultants also reached a consensus that use of the existing corridor would be the route with least environmental impact.

During the first phase of the public consultation program requests were made for the review of further route options, at the following locations:

(1) Gates River valley, Gimse property at Eight Mile Creek (DL1250) .

(2) Birkenhead River valley, near Tewinkel residence (DL2681).

(3) Pemberton Valley, Dennison property.

(4) Lower Cheakamus valley

The first three were inspected in the field by technical staff and the environmental coordinator. Comments on these requests are included in Section 8.2 of this report. In the Lower Cheakamus valley it had been proposed to use the existing 2L1 ROW for the full length of the segment as a mature ROW existed which could be used with low environmental consequences. However, at the Open House held for public consultation at Brackendale local residents requested that B.C. Hydro look at other routes. As a result, segments PR, QS, RS and ST were added to the route network for review, with the consultants returning to the field in November 1989 to study these additions.

In December 1989 the environmental consultants began to prepare their sector reports and B.C. Hydro prepared the Preliminary Planning Report for the project which incorporated the environmental knowledge gained to that date. This report was released by B.C. Hydro in May 1990 to present the conclusions of the environmental consultants and the public opinion on the project gathered during the first phase of public consultation, with the objective of determining whether further opinions on route selection and project design could be identified, and in support of the next phase of the consultation program. Much of the environmental information presented in the Preliminary Planning Report is a summary of material contained in this report.

The environmental consultants completed their sector reports on the initial route network in March 1990. Preparation of this report began then, but completion was delayed until after review of 1990 route alternative studies.

The second phase of public consultation occurred in June 1990 subsequent to the release of the Preliminary Planning Report. This led to identification of the High Cheakamus segment and Function suboption as possible routes and to the addition of them and the Callaghan segment to the route network. To determine the possibility of bypassing the Antoine Creek area and the Indian Reserves, the Ore, Bridge, East and South Pavilion segments and Seton, D'Arcy, and Lokla suboptions were added to the network.

All these new sections were reviewed by the environmental consultants in the summer of 1990 and this report was revised to include their conclusions and the results of the second phase of the public consultation program.

3.3 ASSUMPTIONS INHERENT IN STUDY

In preparation of this report it was recognized that certain assumptions, as listed below, are inherent to project design.

(1) Location of 5L46 is not generally affected by consideration of possible future transmission lines.

(2) This project would ultimately require that a capacitor station be constructed near its mid-point. It is assumed that if a route in the existing transmission corridor is selected, this will be accommodated by expansion of the existing Creekside capacitor station.

(3) Easements can be obtained over private land, but that easements may not be achieved over Indian Reserves.

(4) Construction of the transmission line including clearing, foundations, tower erection, and conductor stringing will generally require road access. The consultants were requested to advise where roads may be inappropriate and to recommend alternate methods of access. Some helicopter work would be necessary.

(5) Where existing access roads are suitably located, they will be used in preference to construction of new access roads.

(6) The existing B.C. Hydro access roads from Seton Portage to D'Arcy (the Highline road) and in the Lower Cheakamus valley will only be upgraded to the extent necessary to carry the construction traffic for this project.

(7) Clearing of any new ROW and along the 2L1 ROW to accommodate 5L46 will be done in accordance with a clearing plan prepared by B.C. Hydro and incorporating standards to protect the line and public, the recommendations of the environmental consultants, and any related recommendations from the vegetation management plan to ensure line safety standards are met.

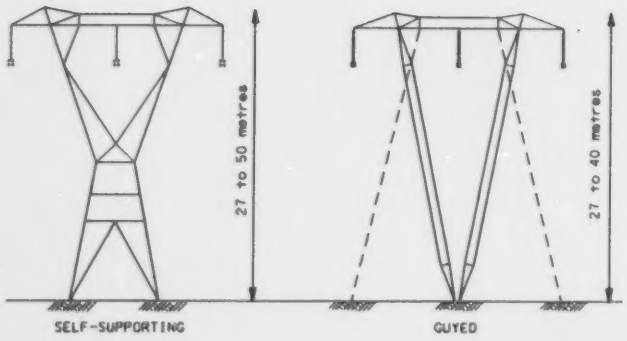
(8) There will be environmental inspection of each phase of construction by staff of the Environmental Resources Division of B.C. Hydro, or their designate.

(9) An Environmental management plan for the ROW will be prepared and put into effect.

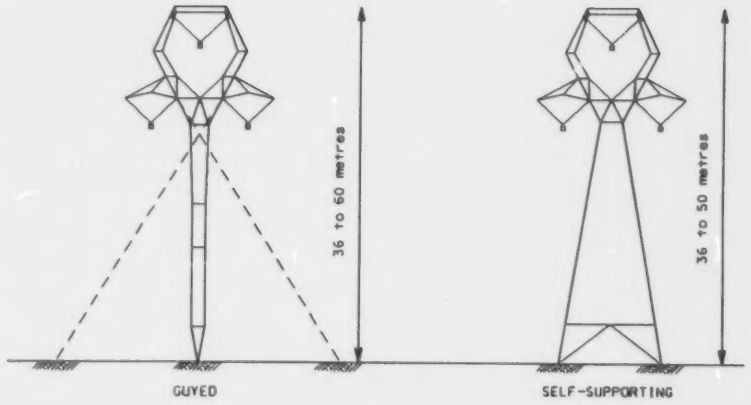
(10) The use of herbicides on the ROW will conform to applicable regulations.

(11) Where 2L1 is removed as part of this project and the ROW is not required by B.C. Hydro, the ROW will be released by B.C. Hydro in accordance with the policies described in Section 7.2.

KELLY LAKE - CHEEKYE
500 kV TRANSMISSION LINE PROJECT
STRUCTURE TYPES



Outline of conventional (flat) configuration

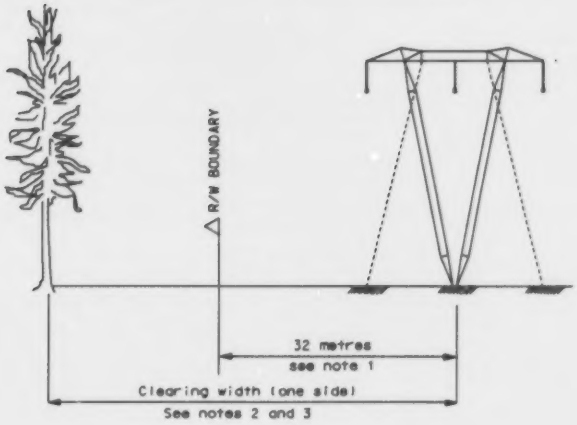


Outline of Delta configuration

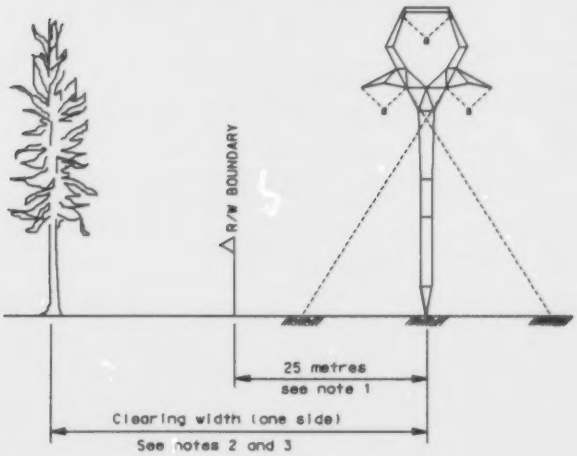
FIGURE 3

KELLY LAKE - CHEEKYE
500 kV TRANSMISSION LINE PROJECT
TYPICAL R/W AND CLEARING WIDTHS

Flat Conductor Configuration



Delta conductor Configuration



NOTES

1) Where existing 2L1 R/W is utilized, R/W edge distance is 30.5 m.
2) Clearing widths are a function of several factors including:
   - tree height
   - ground slope
   - tree growth
   - distance between conductors
   - conductor height
3) Typical anticipated clearing widths on one side of centreline are as follows:
   - 50 metres for FLAT CONFIGURATION
   - 43 metres for DELTA CONFIGURATION

   These are general widths assuming level ground, 30 metre tree height, and 11 metre conductor height.
   Clearing widths will usually *increase* with:
   - an uphill slope
   - taller trees

   Conversely widths will *decrease* with:
   - a downhill slope
   - a higher conductor

FIGURE 4

3.4 PUBLIC CONSULTATION

The public consultation program was designed by B.C. Hydro and its consultants to elicit as much opinion and information from the public as possible to assist in the environmental study and overall project design. The first phase of the program was timed to reach its peak in October 1989, with eight Open Houses along the route, after the basic environmental information had been gathered and the project team briefed on the environmental characteristics of each segment and the specific environmental issues within each. The environmental coordinator attended the Open Houses in each phase of the public consultation program and several meetings with government and public groups to provide an environmental perspective at the meetings.

The second phase of the program included seven more Open Houses in communities along the route during June 1990. This led to requests for review of the High Cheakamus and Function options. The Open Houses were followed by meetings with the Yalakom Community Council, staff of the RMOW, and representatives of the Lillooet Tribal Council. Discussions with the Lillooet Tribal Council continue and are not yet conclusive with regard to the project, but the concerns of the other groups were identified.

The majority of public opinion supported use of the generally favored route which follows the existing corridor. In some cases, site specific concerns regarding protection of a particular property or support for new route changes was voiced. Other than information offered by Mr. Doug Sheriff, of the Yalakom Ecological Society, very little environmental information was offered by the public. Mr. Sheriff's contribution to the understanding of the use by wildlife of the Antoine Creek valley was most useful as little other recorded data exists for the valley.

Government agency staff were most helpful in provision of environmental information. A record of contacts is included in each consultant's environmental report.

3.5 ASSESSMENT OF IMPACTS

It was the responsibility of each environmental consultant to determine a rating system appropriate to the concerns of the resource being studied. The system used for each resource and the assessment of potential impacts in each segment are explained in Volume 2.

In assessing impacts the consultants assumed that B.C. Hydro would maintain its present level of environmental inspection during construction, continue with its standard practices designed to mitigate adverse impacts, and adopt any protective measures listed in this report. The impacts described by the consultants can therefore be considered as net impacts after allowing for standard and site specific measures for environmental protection.

No attempt has been made to combine assessments through a weighting system to provide an overall impact rating for construction of 5L46 in each segment, as it is considered more beneficial that the reader understand the full spectrum of impacts. Generally, potential low impacts were assessed where the project would be constructed on existing ROW with a minimum of further clearing. Medium potential impacts occur where the new line would be constructed adjacent to an existing line. In general, high potential impacts tended to be assessed where the project would require development in segments without transmission lines at this time and where the development of road access with the line could bring major adverse environmental changes.

The types of structures proposed for this project are shown in Fig. 3, and the ROW and clearing dimensions in Fig. 4.

Where the 2L1 ROW is used, further clearing would be required to accomodate 5L46 as 2L1 is not located in the centre of its 200 foot wide ROW, and as 5L46 would typically be located in the centre of the ROW.

3.6 ANALYSIS OF ROUTE NETWORK

Analysis of the route network from an environmental perspective was done by the combined environmental consulting team.

When alternate options were being compared, discussion continued within the environmental consulting team until a consensus was reached on the best overall choice. While the impact assessments are described in Volume 2, the analysis of the network on environmental grounds is discussed in Section 6 of this volume.

The public's environmental input, as expressed through the public consultation program, was added to the environmental assessment. The full results of this process are contained in consultant reports for B.C. Hydro describing Phase 1 and Phase 2 of the public consultation program and are summarized in Section 5 of this report.

The route network was analyzed through a process of reduction by elimination. To end up with a single route through the 1989 network, ten decisions had to be made in terms of a preference for one route option or another in a section of the network. These necessary comparisons are described and analyzed in terms of environment and public preference in Section 6 of this volume. The conclusion reached after analysis is intriguing, in that the public opinion, to the extent that it has been expressed to B.C. Hydro, matched the technical and environmental preference leading to identification of a generally favoured route, except in the Lower Cheakamus Valley where review of a further option (High Cheakamus) was requested and at Whistler where local opinion was not conclusive.

The definition of the public preference must be qualified as the opinion of the Indian Bands in the study area on project routing, other than of the Anderson Lake Band, had not been obtained at the time of preparation of this report. As several segments of the route network affect a number of Indian Reserves, and as any route across a reserve requires the agreement of the Band involved, no firm conclusion can be reached without clarification of the position of the Bands whose reserves are crossed. Therefore, this report also discusses routes which bypass the Indian Reserves in case agreement with the Bands is not reached prior to submission of the application for the Energy Project Certificate (EPC) for the project.

The review of new routes identified in 1990 led to conclusions on their relative merits which are presented in Section 6.0.

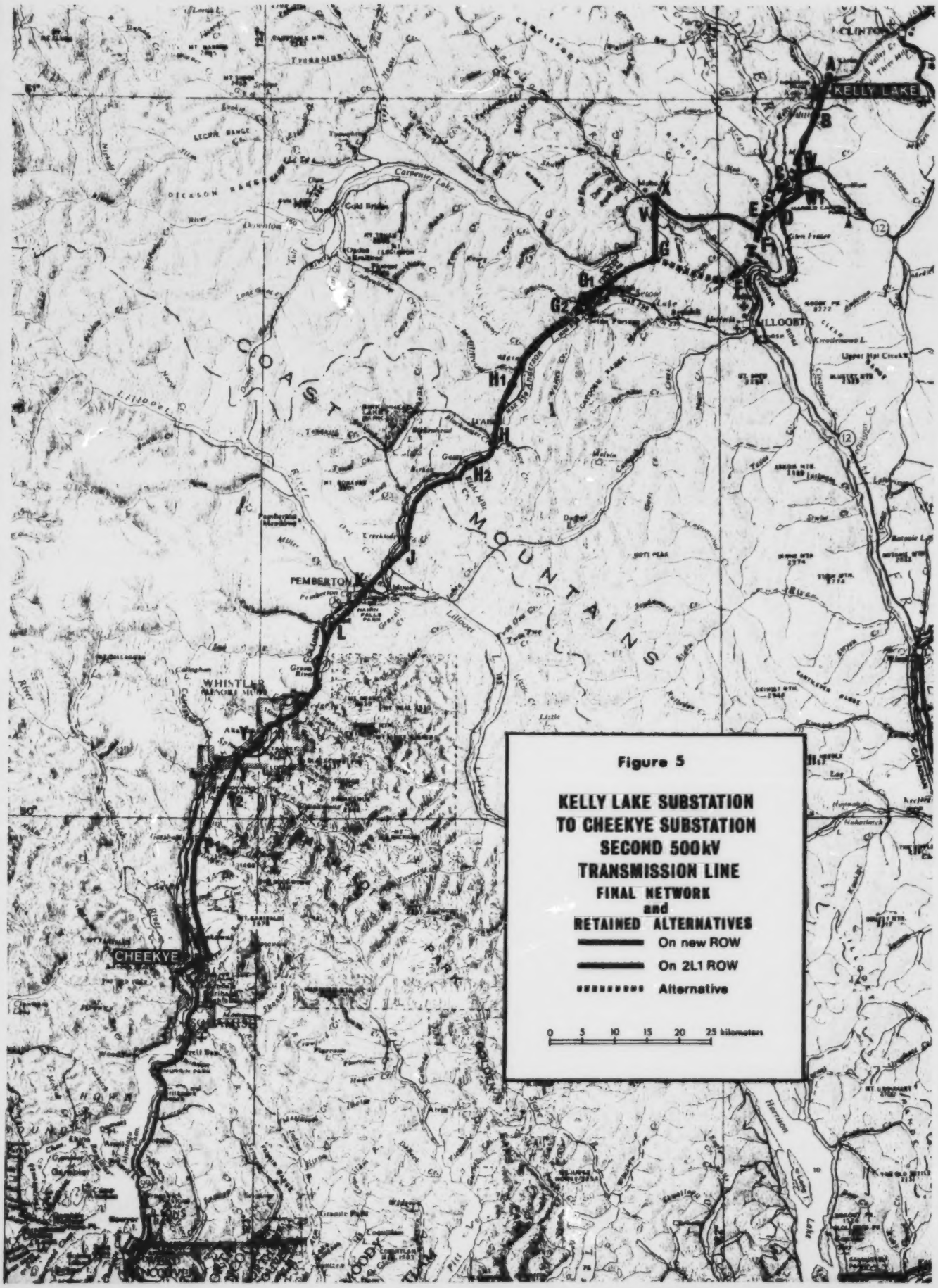
3.7 NATIVE INDIAN INTERESTS

Eight Indian Bands have interests in the study area. In determining the route network it was known, given the topography and the strategic location of many reserves, that segments of the route network would cross some reserves, as do B.C. Hydro's existing transmission lines in the study area. The consent of a Band is necessary to establish a ROW across one of its reserves. The achievement of a ROW on a reserve is thus a matter for negotiation.

At this time various disputes exist between Bands in the study area and B.C. Hydro in relation to present transmission line agreements, past land aquisitions, and historical grievances. The Bands in the northern sector of the study area, other than the Anderson Lake and Mount Currie Bands, have asked the Lillooet Tribal Council to lead the discussions with B.C. Hydro and the council has advised B.C. Hydro it wishes the past disputes to be resolved before agreement is reached on this new project. Negotiations between the Lillooet Tribal Council, member bands and B.C. Hydro were in progress as this report was written. Separate discussions have been, or will be, held by B.C. Hydro with the Anderson Lake, Mount Currie, and Squamish Bands.

The environmental consultants have not yet been authorized by the Bands to enter the reserves, nor has advice been given on the plans of each Band for its reserve lands. The information presented in this report on each reserve is therefore limited to information gained in the 1982-84 study, by inspection from the air or from public roads, or from aerial photographs. The formal opinion of the Bands on the route options has not been obtained other than that of the Anderson Lake Band. Members and staff of the Seton Lake and Anderson Lake Bands attended Open Houses at Seton Portage and D'Arcy. (Note: As of mid-March 1991, B.C. Hydro's land use and socio-economic consultant was able to initiate discussions with various bands.

The present conclusions on route preference are therefore still tentative and await confirmation with the Bands involved. In the meantime, B.C. Hydro initiated a review of routes around reserves in 1990, and intends to indicate these routes in its application for an EPC.


KELLY LAKE
CLINTON
LILLOOET
PEMBERTON
WHISTLER
CHEEKYE
COAST MOUNTAINS
A
B
C
D
E
F
G
G1
G2
H
H1
H2
J
L
V
W
Figure 5
KELLY LAKE SUBSTATION
TO CHEEKYE SUBSTATION
SECOND 500kV
TRANSMISSION LINE
FINAL NETWORK
and
RETAINED ALTERNATIVES
On new ROW
On 2L1 ROW
Alternative
0 5 10 15 20 25 kilometers

4.0 MAJOR ENVIRONMENTAL FEATURES IN EACH SEGMENT

4.1 GENERAL

It is suggested that the reader refer to Volume 2 of this report for a description of the resources and environmental features in each segment prior to reading this section of the report. Volume 2 establishes the background for the project in each segment and assesses the impacts of the project.

This section identifies those environmental features in each segment which are pertinent in terms of determining the best environmental option, and defining possible mitigative measures. When considered together with the results of the public consultation program described in Section 5, this section provides the factual base for comparison of route options.

Sections 4.2 to 4.18 inclusive describe environmental features identified in the 1989 network. This work was supported by recent colour, and black and white aerial photography. Sections 4.19 to 4.28 inclusive describe environmental features identified in the 1990 additions. For the Ore, Bridge, East and South Pavilion, Callaghan, and High Cheakamus segments full photo coverage was not available. As a result, some of the interpretation of terrain units and other environmental features is not as detailed as for the 1989 studies.

4.2 KELLY LAKE (AB) 6.0km

No alternate is proposed to segment AB as B.C. Hydro has an unused portion on the east side of the existing ROW running south from the substation which can accommodate 5L46. There are, however, several items which require attention from an environmental perspective:

Terrain:

The northern slopes of Pavilion Mountain consist of stony coarse morainal and colluvial material prone to erosion.

Land Use:

There is a hay field adjacent to the substation, but it is not a constraint to location.

Vegetation:

Retention of natural vegetation on steep slopes rising to Pavilion Mountain is highly desirable to control erosion and for aesthetic reasons.

Visual & Recreation:

Slopes of Pavilion Mountain are highly visible from Clinton/Canoe Creek road.

Heritage:

Four heritage sites within the former Clinton IR2 would require protection.

Social:

This segment is not close to any settlement.

4.3 PAVILION (BCEF) 29.3km

In segment BCEF, 5L46 would lie adjacent to the east side of 5L41 across Pavilion Mountain on an uncleared section of an existing ROW. Near node C it would cross 5L41, 2L90 and 2L91, to continue on a new ROW adjacent to the south east side of 5L42 to nodes E and F. No new access roads would be required along segment BCEF except for spurs to new tower sites.

Sub-option CDE is an alternative in which 5L46 could take advantage of an existing unused ROW on the Pavilion Indian Reserve. Sub-option CDE would continue south adjacent to 5L41 crossing over it at node D, south of Pavilion, and require a new isolated ROW for the Fraser River crossing over to node E.

Terrain:

The terrain on the east and west banks of the existing Fraser crossing is sensitive to disturbance but access roads already exist to the crossing site for CE.

The terrain along the east side of the Camelsfoot Range is steep and susceptible to high impacts, however access roads have already been constructed for 5L42. Helicopter construction would be an advantage at some difficult sites on north side of Bridge River.

Sub-option CDE would require a new access road across a silty glaciolacustrine terrace, and terrain impacts could be high.

Land Use & Agriculture:

Clearing of more of the existing ROW over the ranchlands of Pavilion Mountain would increase the grazing capability of the land, but the traverse of 1.5km of irrigated haylands would make cropping more difficult. Soil compaction is an issue in the agricultural fields.

5L46 would require 1.1km of new ROW in the Pavilion Indian Reserve, but would have little impact on the range lands because there are very few trees, provided there is no further construction of access roads. The route would be concealed from Pavilion village.

The clearing of new ROW on the east side of the Camelsfoot Range would increase grazing opportunities.

Sub-option CDE crosses cultivated fields on the east and west side of the Fraser River which would create difficulties for irrigation.

5L46 would require 0.3km of new ROW on the Bridge River Indian Reserve north of Node F but no conflicts with present land use are anticipated.

Forestry & Vegetation:

Segment BCEF is considered to have low forestry impact potential, but many sensitive sites exist in the dry terrain of the Fraser Canyon and the Camelsfoot Range.

Fish & Wildlife:

Bighorn sheep use the range on the east side of the Fraser River. A new access road to this area, as for sub-option CDE, is highly undesirable from the wildlife perspective.

There are no concerns for fish as the Fraser is crossed at a high elevation.

Visual & Recreation:

The visual impact potential of segment BCEF is considered low to moderate, but the visual impact potential of sub-option CDE is rated severe because of the separated river crossing, two extra crossings of Highway 12, and the crossing of 5L41, 2L90 & 2L91, which has to be done at a site exposed to view from Highway 12.

Heritage:

Sites rated as having high importance have been identified on Pavilion Plateau, both sides of the Fraser River, and on the plateau overlooking the Bridge River crossing.

Social:

A crossing of the Fraser Canyon adjacent to 5L42 presents less hazard to light aircraft than a separate crossing.

This segment passes to the west of the buildings of the Diamond S Ranch, keeps away from Pavilion Village, and ranch homes on the west side of the Fraser, it passes through an area of scattered homes on the Bridge River IR. Sub-option CDE comes much closer to the ranch homes on the west side of the Fraser.

4.4 ANTOINE (BG) 44.3km

Use of segment BG requires a new ROW for its full length and development of new access roads on Pavilion Mountain, in Cavanagh Creek valley, between the Fraser River and McKay Creek, in Antoine Creek valley, and on the north side of Mission Ridge.

Terrain:

The upper reaches of Cavanagh Creek valley consist of exposed bedrock complexed with gullied, rubbly colluvium, slide debris and talus.

On the east side of the Fraser River crossing, the surficial material consists of deeply incised, silty glaciofluvial deposits with evidence of instability. In both these units there could be hazard to the line if slopes are destabilized by construction activity and high impact potential from road construction.

The west side of the Fraser River crossing consists of deeply incised silty and sandy, glaciofluvial and glaciolacustrine deposits. These conditions create a hazard for the line if slopes are destabilized by construction activity and high impacts from road construction.

The escarpments at the head of Antoine Creek and along the west side of the Antoine Creek valley represent very difficult terrain for construction of roads and transmission lines. The slopes are very steep, consisting of exposed bedrock with extensive gullied, rubbly colluvium with many rock falls and debris slides. Construction of roads in this terrain could have high impacts. Helicopter construction could be necessary to avoid these impacts. Construction of towers would also be very difficult because of the nature of surficial materials, steep slopes, and lack of road access for equipment.

The north side of the Bridge River canyon consists of a glaciofluvial terrace subject to active erosion at the toe and in gullies.

The ascent to Mission Ridge involves rising up many steep slopes with exposed bedrock, talus and shallow morainal deposits. The impacts of road construction would be high.

Land use & Agriculture:

ALR lands are crossed on the bench west of the Fraser. In Antoine Creek valley the line would cross DL3223 where a remote community has been established and DL3222 near its mouth where there is also some settlement.

Vegetation & Forestry:

Segment BG is assessed as having medium overall forestry impact potential. The only exception is in Antoine Creek valley where the steep dry terrain has resulted in low forest values and high costs for extraction. Given its scenic and wildlife values the valley is clearly a candidate for wilderness classification by the Ministry of Forests. The line would probably prevent such classification.

Restoration of disturbed sites in steep dry terrain of Antoine Creek valley would be very difficult.

Fish & Wildlife:

The east side of the Fraser River from Moran to Cavanagh Creek is important range for California bighorn sheep. Construction of an access road would have a major adverse impact on the sheep.

The Antoine Creek valley is used by deer, bighorn sheep, furbearers and mountain goats. At present, there is no public access road. An access road would result in high impacts on wildlife. The valley is included by the Wildlife Branch in its proposed Yalakom Wilderness Unit.

The Bridge River canyon is well known for its mountain goats. 5L46 would be close to the crest of the bluffs and the access road would increase hunting pressure on the goats.

Tributaries to the Bridge River from Mission Ridge are important water sources maintaining the remnant salmon spawning areas in the Bridge River; protection of water quality is important.

Visual & Recreation:

The Fraser Canyon is a dramatic landscape of provincial significance. Crossing the Fraser River with 5L46 and the construction of an access road on the east side would have a high visual impact, particularly for river rafters.

Antoine Creek valley is recognized as having potential as a designated wilderness area as a result of its stark rugged terrain. 5L46 would create moderate visual impacts in the valley, with a high level of change.

The Bridge River at the 5L46 crossing site is highly scenic with the giant Camelsfoot Bend nearby. This crossing would have high visual impact.

Heritage:

The line would traverse an old village site in the Kelly Creek valley which is a major heritage site, and would pass close to another site at Kelly Creek IR3. The west side of the Fraser River valley is also rich in sites. Potential for undiscovered additional sites is high.

The Bridge River valley near the crossing site has high potential for heritage sites but has not been fully studied.

Social:

Segment BG avoids settled areas except in the Antoine Creek valley (DL3223) and at the junction of Antoine Creek and the Bridge River (DL3222). Construction on this route would bring a large increase in traffic to the Fraser west side road and the Bridge River road.

DL3223 is owned by members of the Yalakom Residential Cooperative who have chosen to live here without many of the standard amenities of urban life.

4.5 MISSION (FG) 15.0km

In segment FG 5L46 would rise up Mission Ridge using a new ROW adjacent to the south side of 5L42. Only new spur access roads would be required.

Terrain:

The upper part of Mission Ridge is in the subalpine and alpine zones and has sensitive terrain and vegetation, which is slow to recover after disturbance.

Land Use & Agriculture:

A new ROW would be required for 1.2km on the Bridge River Indian Reserve. No adverse impacts would occur on existing land use. Some extra grazing land would be created. There is the potential for development of rural homes near the ROW on the reserve.

Forestry & Vegetation:

The forestry impact potential would be low to moderate but there are many sensitive sites in the subalpine and alpine areas where revegetation would be difficult.

Fish & Wildlife:

Potential wildlife impacts are low as access has been established along 5L42.

Visual & Recreation:

Potential impacts are assessed as low, but the route crosses a large UREP around some tarns near the crossing of Camoo Creek.

Heritage:

Sites of interest exist on the Bridge River Indian Reserve near node F. One, an old village site, has very high significance.

Social:

There are no residences near this segment except at node F where there are a few scattered homes.

4.6 DUFFEY (FJ) 89km

In segment FJ, 5L46 would use a new isolated ROW on Bridge River Indian Reserve for 1.7km, then continue on a new ROW adjacent to 2L90 and 2L91 for 6km to the west side of Lillooet. From Lillooet, the line would run on a new isolated ROW for 71.3km to the Lillooet River valley, to end with 10.0km on a new ROW adjacent to north side of 3L2.

New access roads along the ROW would be required in Bridge River Indian Reserve and on the west side of Lillooet. Spur access roads to tower sites would be required throughout Cayoosh Creek valley. A new access road along the ROW might be required on west side of Joffre Creek valley.

Terrain:

The hillsides north of Lillooet are steep, with surficial deposits of coarse colluvial material. Because scree and talus slopes are common, the impacts of road construction would be high.

The Cayoosh Canyon upstream to Cinnamon Creek consists of very steep exposed bedrock faces with steep colluvial deposits at their base. The impacts of construction of access roads to tower sites would be very high. Rockfall presents a considerable hazard.

From Cinnamon Creek to the west end of Duffey Lake along the south side of the Cayoosh Creek valley the dominant terrain type consists of shallow drift deposits over bedrock. Avalanche tracks, talus, landslides and rockfalls are common on the upper slopes and often extend to the valley floor. There are many areas of high hazard from avalanches and high potential for erosion between Gott Creek and Joffre Creek. In these areas each access road would have to be carefully planned and constructed.

Land Use & Agriculture:

The route would require 1.7km of new ROW in Bridge River IR1, 1.5km in Lillooet IR1A, 1.5km in Lillooet 1R1, and 6.7km in Mount Currie IR6 and 7.

North of Lillooet the route would encroach on a long narrow irrigated hayfield creating a major impediment to its use.

5L46 would be highly visible as it skirts Lillooet but would not encroach on land with development potential in the community. It crosses land with some development potential in Lillooet IR1. In the Seton River valley 5L46 would traverse B.C. Hydro's Recreation Area, but avoid the campsite.

In Mount Currie IR6 and 7 the ROW would occupy land with development potential and would be adjacent to the new village.

Forestry & Vegetation:

The forestry impact potential in this segment is rated moderate to high because of the loss of productive growing sites.

Fish & Wildlife:

As the route parallels Cayoosh Creek for its full length there is a risk of cumulative impacts from siltation effects.

Wildlife values in the Cayoosh Creek valley are high, and the animals are readily visible in a natural setting. The potential impacts of 5L46 on wildlife would be high in terms of disturbance, increased road access, and loss of habitat for mountain goat, grizzly bear, black bear, and deer.

Visual & Recreation:

Potential visual impacts in the Fraser Canyon, near Lillooet, and through the Seton River valley are considered high, but through the Cayoosh Canyon they are considered severe due to the nature of the terrain. The impact potential from Cinnamon Creek to Duffey Lake is also rated high. Impact for the remainder of the segment is assessed as low to moderate, with the exception of the section near the new village on Mount Currie IR6 which is rated high.

The route would pass very close to Lower Joffre Lake and be highly visible from many parts of the Joffre Lakes Recreation Area.

In the descent of Joffre Creek valley 5L46 would be highly visible from the major viewpoint on the highway above Lillooet Lake.

As the section of this route from Lillooet to Lillooet Lake is destined to become a major tourist route there is considerable concern that a transmission line would detract from the natural quality of the landscape.

Heritage:

Most of segment FJ has low impact potential. However, sections with high potential exist in the Fraser River valley, near Lillooet, in Seton River valley and in the vicinity of Mount Currie IR6. Sites are recorded in Fraser River and Lillooet River valleys.

Social:

The route extends for 6.5km to the north and west of Lillooet, highly visible from the community, and from its main recreation area in the Seton River valley. In Mount Currie IR6, the route passes close to the new village. Construction along this route would bring a significant increase in traffic to the Duffey Lake road each summer for 5 years. Accommodation would probably be in Lillooet and Pemberton, although an intermediate camp might be used.

4.7 ANDERSON (GH) 39.5km

In this segment 5L46 would run on new ROW adjacent to the south side of 5L42 for 14.5km. It would then descend the side hill west of Seton Portage on new ROW for 0.5km, crossing 3L2 and 2L2, to reach the 2L1 ROW. After removal of 2L1 it would then use this ROW for 20.5km to near D'Arcy, but in the last 4km would rise on the sidehill to run adjacent to 3L2.

This segment is served by B.C. Hydro's 'Highline' road from D'Arcy to Seton Portage and an access road along 5L42 from there to node G. It is anticipated that between Seton Portage and D'Arcy some new access roads would have to be developed between the Highline road and the 2L1 ROW, both to remove 2L1 and to construct 5L46. However, many private roads exist and preference would be given to using these.

The 2L1 ROW may have to be straightened to accommodate 5L46 as span lengths would be different. In addition, the existing clearing would have to be widened to 500kV standards. It should also be noted that 2L1 is often not located on the centre line of the ROW, even where 5L46 is located on the centre line extra clearing would be required.

Terrain:

The surficial deposits on the lower slopes above Anderson Lake consist of a steep coarse gravelly fluvial-colluvial apron. They are deeply gullied in many places and highly prone to erosion. If access roads down and across these deposits are not carefully located and constructed, high terrain impacts would occur.

Land Use & Agriculture:

5L46 would require 1.5km new ROW through the northwest corner of Seton Lake IR5A, but the Seton Lake Band would benefit from release of 3.8km of 2L1 ROW on their reserve lands. 2L1 is close to Anderson Lake, usually on steep slopes, but does cross some land with development potential for housing or tourism.

The use of the 2L1 ROW along Anderson Lake creates little conflict as land use patterns have already adjusted to the ROW.

At D'Arcy the proposed route adjustment would remove a 4km length of 2L1 from close to the community, including 1km on the Nequatque IR1, and require 300m of new ROW higher on the hillside in the same reserve. The lower land is much more suitable for development. The relocation off the 2L1 ROW on the Blackwater River fan reduces the impact of transmission lines on this parcel of developable land.

Forestry & Vegetation:

The impacts on forestry are assessed as low to medium. The Highline road is currently being used to haul out logs, but this traffic is not enough to interfere with construction.

Fish & Wildlife:

The potential impacts on both resources are assessed as negligible.

Visual & Recreation:

Moderate visual impact is confined to the 1km section where 5L46 would descend to reach the 2L1 ROW, which is visible from the east end of Anderson Lake. Elsewhere impacts are assessed as low. Improvements would occur at D'Arcy with removal of 2L1 through the community.

Heritage:

There is a group of sites just west of Seton Portage which may be affected by road improvements and access to 2L1 ROW; further sites requiring protection exist on plateau south of McGillivray Creek. A site requiring investigation occurs north of McGillivray Creek.

Social:

The route passes close to several areas of rural settlement scattered along Anderson Lake, but avoids the settled areas at Seton Portage and D'Arcy.

There are many established water intakes on streams along Anderson Lake, and D'Arcy Creek provides the water supply for D'Arcy. There is potential for adverse impacts from construction of new access roads and activity along 2L1 ROW and Highline road.

There is only limited accommodation available in Seton Portage, so it is possible a construction camp may be necessary here. Camps have been established here previously and adequate sites are available. Traffic on Highline road would be increased markedly for 5 years.

4.8 BIRKENHEAD (HI) 20.0km

In this segment a new ROW would be required together with the necessary access road system.

Terrain:

The route avoids the floodplain and wetlands of the Blackwater River. Along Birkenhead Lake the route has to be high enough to span the deeply incised avalanche gullies without having towers located on the fans where they would be exposed to slides or debris flows.

Land Use & Agriculture:

The route avoids Anderson Lake IR5 and traverses the slopes above the agricultural land in the Blackwater River valley.

The route traverses Birkenhead Lake Provincial Park in full view of the recreation subdivision at the southern end of the lake and the major recreation site at the northern end.

Forestry & Vegetation:

The forestry impact potential is assessed as medium. Potential impact on vegetation in the park is assessed as high and opening up a clearing through the closed canopy forest on the east side of Birkenhead Lake would greatly increase the risk of blowdown in the adjacent forest.

Fish & Wildlife:

The mountain goats in the park would not be adversely affected except by disturbance from construction activity, as their favoured terrain is high above the route.

Visual & Recreation:

Construction in this segment would have serious visual impacts. In the Blackwater River valley they would be moderate, at Blackwater Lake and in the approach to the park they would be high, and through the park, severe.

Heritage:

No sites are recorded near the route, potential is low with some areas suggestive of up to moderate potential.

Social:

The route does not lie close to any area of settlement. There is broad public appreciation of the scenic natural quality of Birkenhead Lake Provincial Park. Constructions would bring much traffic to Blackwater and Birkenhead Lake roads.

4.9 GATES (HJ) 27.5km

In this segment 5L46 would use new ROW for 1.2km from H, then 1km of 2L1 ROW to cross the highway, then 5km of new ROW high on the south side of the Gates River valley to join 5L42 east of Gates Lake. It would then stay close to the south side of the 5L42 for 7km. It is intended that the section high on the south side of the Gates River valley would be erected by helicopter. New access roads would be required in the portions at lower elevation.

West of Gates Lake the route joins the 2L1 ROW and uses this south to J. There is potential to improve the alignment in this portion, a further review would be made in the design stage.

Terrain:

The valley sides consist of steep bedrock dominated slopes with shallow colluvial deposits. There is a deep colluvial-fluvial apron extending along most of the lower slopes with slopes ranging higher than 20%. The upper slopes are classed as a high hazard area with high impact potential.

The valley wall on the south side is broken by a series of deeply incised creeks, and there are avalanche tracks, talus slopes, and gullies subject to debris flows.

The route picked on the south side rises quickly to stable rock features above the apron and descends slowly on a long traverse. It can span all the gullies, talus slopes and other adverse features. Helicopter construction would greatly reduce terrain impacts in this part of the route where road access has not been developed to date.

Land Use & Agriculture:

There is a very limited area of land with development potential in this corridor and the Squamish-Lillooet Regional District Official Regional Plan proposes that 5L46 be located so as to minimize the impact on that land. The removal of 2L1 from the valley floor from D'Arcy to Pemberton Pass and location of 5L46 on the sidehill achieves that objective in the Gates River valley section of the corridor.

Removal of 2L1 from the valley floor in the Gates River valley would be of benefit to the present agricultural use of the land.

From Pemberton Pass to Creekside the route passes through units defined as residential settlement areas near Gramsons and at Creekside.

Forestry & Vegetation:

The forestry impact potential in this section is assessed as low, largely due to the use of the 2L1 ROW and the location on the steep slopes of the Gates River valley.

Fish & Wildlife:

The proposed route in the Gates River valley will result in about 8km of new ROW clearing parallel to the Gates River. This is a small stream important to fish and as a water supply to a spawning channel at D'Arcy. There is a risk of cumulative impact from siltation. The potential wildlife impacts are low to moderate.

Visual & Recreation:

It is considered that the visual impacts between D'Arcy and Pemberton Pass would generally be moderate but with some small sections of high impact.

From Pemberton Pass to Creekside the impacts of construction of 5L46 on the 2L1 ROW would be low. However this section is presently unsightly and improvements could be made by routing on the east side of the valley.

Heritage:

There are a variety of sites known, none of major significance within the ROW.

Social:

Residents of this area opposed use of this segment in 1983 because of the proximity of the 2L1 ROW to many homes and concern over electrical and magnetic field (EMF) effects. Moving 5L46 well away from the 2L1 ROW and adjacent homes has been accepted as an improvement by most residents.

Some residents are still concerned regarding visual impact of the new line near DL 1250 at Eight Mile Creek. It is recognised that increased clearing and two structures would be visible, but at some distance from homes. A request has been made to review location at DL 2681 near Gramsons.

Construction would increase traffic on Pemberton - D'Arcy road. Available local accommodation would be used by workers.

4.10 OWL (IK) 25.0km

Segment IK would require a new ROW for its full length. A new access road would be required over the Owl/Fowl uplands to construct the line.

Terrain:

The south side of the Birkenhead River valley consists of outcrops of bedrock with deep deposits of gravelly, sandy, colluvium on the lower slopes. This material is prone to erosion, and the impacts of road construction in this steep terrain would be high.

In the upland area there are many deposits of gravelly morainal material, with minor areas of organic and sandy fluvial materials. All these are prone to erosion and impacts could be high as a result of road construction.

Land Use & Agriculture:

Land use impacts would largely be confined to the Lillooet River valley where an area of farms and residential settlement occurs north west of Pemberton.

This route allows removal of 2L1 from the Village of Pemberton, but replaces it with a new ROW to the west. Removal of 2L1 and 2L2 from the limited developable area is a planning objective for the Village of Pemberton.

Forestry & Vegetation:

Forestry impact potential is moderate to low except for the impacts on wilderness values in the Owl/Fowl uplands.

Potential impacts on vegetation in the subalpine upland could be high as a result of road construction and increased access of motorized vehicles to the area.

Fish & Wildlife:

The potential impact on wildlife is assessed as moderate, due largely to opening the area by construction of a road.

Visual & Recreation:

The potential impacts of 5L46 in the Owl/Fowl uplands which form part of the Ministry of Parks proposed Mount Ronayne Recreation Area are assessed as severe. This is an attractive subalpine unit very suitable for summer recreation.

Visual impact in the Pemberton Valley would be high due to the high visibility of 5L46 as it would descend the east side of the valley and swing around Pemberton on the west side.

The route requires a crossing of Nairn Falls Provincial Park at a sensitive area between the campsite and the attraction of the falls where visual and recreation impacts would be severe.

Heritage:

No sites are known, potential is low with moderate to moderate-high sensitivity in limited areas.

Social:

The route passes close to an area of rural settlement west of Pemberton then crosses Pemberton Creek, the watershed for the Village of Pemberton. Clearing and maintenance of the ROW could cause siltation. Removal of 2L1 from near the Signal Hill School is seen as positive. Construction in this segment would increase traffic on Pemberton - D'Arcy, and Birkenhead Lake roads, and on Owl Lakes track.

4.11 RYAN (IM) 57.0km

Segment IM would require a new ROW for its full length and access roads to be constructed in Tenas Creek valley, in the head of Owl Creek valley, on the east side of the Lillooet River valley, up tributaries of Ryan Creek, in the head of Rutherford Creek valley, and over the ridge between Rutherford Creek and the Soo River.

Terrain:

Two extensive areas of terrain hazard exist due to avalanches, slides, and rockfalls, namely the upstream half of Tenas Creek valley and along the Ryan River valley and its tributary valley leading to the pass to Rutherford Creek valley. Both of these areas present severe problems for construction and maintenance of 5L46 although it is considered that a safe route exists through them. Construction of access roads in the subalpine terrain in these areas would have moderate impacts, if adequate reclamation were done.

Land Use & Agriculture:

The route is close to the Birkenhead Lake Estate subdivision and 5L46 would be visible as it crosses the valley floor and enters Tenas Creek valley.

The line would cross the farmland of the Pemberton Valley near Gingerbread Creek. Towers on the farmland could affect irrigation, and other operations.

Forestry & Vegetation:

The forestry impact potential is assessed as moderate to high due to loss of forest land and interference with active logging operations on Ryan River and Rutherford Creek logging roads.

The vegetation in the subalpine and alpine sections of Tenas Creek valley, Ogre Lake, Ryan-Rutherford, and Rutherford/Soo divide is very sensitive to disturbance.

Fish & Wildlife:

The route crosses important deer winter and spring habitat on the north side of the Lillooet River valley, and traverses terrain in the Ryan River and Rutherford Creek drainages that is important for mountain goat and grizzly bear. This area, together with Miller Creek drainage, offers some of the best viewing opportunities for these species near Vancouver. It is highly desirable to retain this undisturbed use by wildlife and related viewing opportunities.

Visual & Recreation:

This segment cuts through one of the most scenic areas of the Mount Ronayne Recreation Area proposal of the Ministry of Parks and would have severe visual impact in the Ogre Lake/Tenas Creek area (5km).

The route would have high visual impact in its crossing of the Pemberton Valley (7km), in the alpine terrain at the Ryan/Rutherford divide (2km) and the Rutherford/Soo divide (2km). Elsewhere it would have moderate visual impact.

Heritage:

No sites are recorded in segment IM, impact potential is primarily low with low-moderate to moderate-high sensitivity identified in limited areas.

Social:

The route is close to the southern end of the Birkenhead Lake subdivision and to two homes in the Pemberton Valley. Construction in this segment would bring increased traffic to Pemberton Valley, Rutherford Creek, and Birkenhead Lake routes.

4.12 PEMBERTON (JK) 10.0km

In this segment 5L46 would use the 2L1 ROW to the Lillooet River (4.5km), a new ROW adjacent to 5L42 across the farm lands of the Pemberton Valley (2km) and over Signal Hill (3.5km). No new access roads would be required except spurs to tower sites on Signal Hill.

Terrain:

The terrain is generally favourable. The Lillooet River has a well defined floodplain which is periodically inundated. The existing transmission lines have withstood the floods to date. Care would be required in road construction on Signal Hill to avoid potential impacts because of the steep slopes, including some areas of talus. Helicopter construction would reduce terrain and visual impacts of construction on Signal Hill.

Land Use & Agriculture:

The Village of Pemberton is very restricted by the limited amount of developable land above the flood plain. A considerable portion of this limited area is taken up by the 2L1 and 2L2 ROWs.

A benefit of this project is the opportunity to remove 2L1 from the village. As 2L2 will provide the feed to the village substation, it cannot be moved.

Removal of 2L1 would take one transmission line away from the Signal Hill School and increase the potential of a proposed residential subdivision in DL165 east of Pemberton. In addition, 2L1 would be removed for 13km south of Pemberton where it is adjacent to the highway. 5L46 would be located elsewhere.

The new route across the farmlands east of Pemberton involves crossing 2km of high capability agricultural land. About 5 towers are required. The impacts would be reduced if the tower locations are matched with those of 5L42 to suit cultivation patterns.

A proposal has been made to refine the present alignment of 5L42 and the alignment of 5L46 across the farm lands to reduce impacts on land values. This proposal is under review.

Forestry & Vegetation:

Impact potential is low to moderate due to use of 2L1 ROW and farmlands.

Fish & Wildlife:

Impact potential is low because the existing 2L1 ROW would be used through high capability deer winter range between Creekside and Lillooet River.

Visual & Recreation:

The impact potential of this section is assessed as low, except for 1km in Nairn Falls Provincial Park. The impact potential on the park is assessed as moderate, because the line would cross the eastern arm of the park, but would be away from activity areas. The distance of the line from the campground would be increased if 5L46 were located on the east side of 5L42 instead of the west.

The important view in this segment is that of Mount Currie from Pemberton. The new ROW on Signal Hill would be in the middle ground of this view. Impact would be reduced by location on the east side of 5L42, and by avoidance of road construction within ROW.

Heritage:

No significant recorded sites are located within the proposed ROW.

Social:

Removal of 2L1 from the Village of Pemberton, Signal Hill School and adjacent rural settlement is strongly supported. The new route passes close to rural homes near Owl Creek, in the farmland east of Pemberton, and on the north side of Signal Hill.

4.13 GREEN (KL) 2.0km

Segment KL requires a new ROW on a sidehill above Nairn Falls Provincial Park. New access roads would be required.

Terrain:

No problems areas are known.

Land Use & Agriculture:

Because segment KL is all on forest land, there is no potential impact on other uses.

Forestry & Vegetation:

Potential impacts are assessed as low.

Fish & Wildlife:

Impacts would be negligible.

Visual & Recreation:

Visual impacts are assessed as low, partly because 2L1 would be removed from the entrance to the park.

Heritage:

This segment has a low potential impact for heritage, because there are no recorded sites near the route.

Social:

There is no settlement along segment.

4.14 SOO (LM) 18.0km

Segment LM requires a new ROW for its full length and is separated from other lines. Existing logging roads would provide access to most of the length, spur roads would be necessary to tower sites.

Terrain:

The route ascends a steep slope for 2km west of Highway 99 where there is evidence of mass wasting and erosion. Care would be required in location of towers and access roads.

In the Soo River valley the route lies over the toe of the north facing valley slopes well above the wetlands. These slopes are generally less than 30% and consist mostly of deep blankets of glacial till, with favourable soil conditions for transmission line construction. No impacts are anticipated on the wetlands.

Land Use & Agriculture:

Segment LM lies wholly within the provincial forest. Development potential is low.

Forestry & Vegetation:

Potential forestry impacts are assessed as high due to loss of productive sites. The important wetlands in the valley bottom would not be affected by the line.

Fish & Wildlife:

The potential impacts on wildlife are assessed as moderate to high due to the variety of wildlife associated with the varied habitat and the effects of disturbance. The wetlands themselves would not be affected.

Visual & Recreation:

High visual impact is anticipated at crossing of Green River valley and Highway 99. The rest is assessed at moderate impact as there is potential for use of the Soo River valley for summer and winter recreation by visitors to Whistler.

Heritage:

Heritage potential is primarily low with limited areas of low-moderate sensitivity.

Social:

As planning for the total recreation land base of Whistler has not yet occurred, no firm plans exist for the Soo River valley. Review of the land base indicates that this valley will be of importance to Whistler in the future. The Soo valley forest road would receive a major increase in traffic.

4.15 WHISTLER (LN) 37.0km

In this segment a new ROW close to 5L42 would be used from node L south to the Green River slide (8km). The existing 2L1 ROW would then be used, apart from one minor diversion at Green Lake, to the bench above the west side of Alta Lake (16km) where a section of new ROW starts. From the bench to Miller Creek (2km) new separate ROW would be used. From Miller Creek to a point west of the garbage dump (3km) a new ROW adjacent to the north side of 5L42 would be used. After crossing 5L42 a new separate ROW would be used over the ridge east of McGuire (7km) until meeting again with 5L42 near the north end of Daisy Lake. 5L46 would then cross 5L42 and lie on new ROW adjacent to 5L42 to cross Daisy Lake and return to 2L1 ROW (1km) at node N.

It should be noted that the work in 1990 has resulted in changes to this route south of Miller Creek.

In general, adequate road access exists along virtually the whole segment. Some extension of existing logging roads may be required in crossing the ridge east of McGuire.

Terrain:

Near the junction of the Soo and Green Rivers the route crosses the toe of the Green River slide. Part of this is visible from the highway as a collection of large boulders on its east side. The route lies on the east side of 5L42, representing a further intrusion onto the toe of the slide, until it crosses 5L42 to return to the 2L1 ROW at the south end of the slide. It is recognized that there would be problems in construction of the line in this section, and the route would have to be carefully placed during detailed design to ensure that line security is maintained.

The route avoids the fluvial deposits on the fan of Rutherford Creek where a tower was lost due to erosion of its foundation in 1980.

The existing 2L1 ROW from the Soo River to Alta Lake has proven to be one of low hazard and low impact over the years. The wetlands between Mons and the north end of Alta Lake (2km) are the main terrain unit of interest. The organic and fine textured floodplain deposits are of such depth that a piled foundation would probably be required for the towers. As the towers for 5L46 would create greater foundation loads than those of 2L1, and as the tower spacing for 5L46 would be different than for 2L1, the existing foundations cannot be used.

It is anticipated that a temporary access road spur would have to be constructed to each tower site, using geotextile base and clean gravel, to provide access for the pile driving equipment, material delivery and tower erection equipment. The roads would be removed, together with geotextile, on completion of the work. It would be necessary to carry out the work during the dormant season to keep adverse impacts on the wetlands low.

Impacts on the new route section west of Alta Lake are assessed as low as the terrain is stable and dominated by bedrock. One tower would be required in the small area of wetland along Miller Creek. The route crosses the large coarse glaciofluvial fan of the Cheakamus River before rising over the ridge to the east of McGuire. Here the terrain is again stable and consists of shallow morainal deposits on hummocky bedrock knolls and steep bedrock ridges. Terrain impacts are anticipated to be low.

Land Use & Agriculture:

Whistler is experiencing rapid growth as it has evolved into a world class four season destination resort. The Resort Municipality of Whistler (RMOW) places strong emphasis in the Official Community Plan, and its policies, on retention of a high quality natural environment and on creation of a high quality built environment. The community is dedicated to the service of leisure pursuits, and developable land, whether for accommodation, commerce, or provision of leisure facilities such as golf courses is of very high value. This high value and the limited period of summer growth preclude any agricultural use of the land.

The three existing transmission lines (2L1, 2L2, 5L42) were constructed in 1948, 1959, and 1970 respectively, before Whistler began its recent period of rapid growth. The RMOW is sensitive to the visual impact of the lines in the community, which is discussed in the following section.

Terrain conditions within the RMOW have imposed many limits on development. The result is that the community has developed in a series of nodes such as Emerald Estates, Alpine Meadows, Tapley's Farm, White Gold, the Village, Whistler Creek and Function Junction, with some limited settlement along the west side of Alta Lake and north of Alpha Lake.

The transmission lines are generally located on land not suitable for development, such as the bluffs east of Green Lake and the wetlands and the steep slopes above Function Junction, but they do occupy land with development potential, or come close to settlement, at Mons, Tapley's Farm, west side of Alta Lake, north of Alpha Lake, Function Junction, and at the Municipal dump. The impact of the project on land use is discussed separately for each of these sites.

At Mons 5L46 would replace 2L1, the central of the 3 lines. As the lines here are converging, and not adjacent, to each other, some further clearing would be required to accommodate 5L46. No change would be required in ROW widths.

Tapley's Farm subdivision extends to the southern boundary of the combined ROW for the 3 existing transmission lines which here are adjacent to each other. As 5L46 would replace the centre line, 2L1, there would be no change in land use.

At the north end of Alta Lake 2L1 separates from the other lines and rises to the bench above the lake. 2L2 and 5L42 run closer to the lake above the West Side road. A small group of houses is located south and east of 2L1 where it turns on the bench west of Alta Lake, and a continuous string of homes exists below the West Side Road along Alta Lake above the railway. The replacement of 2L1 by 5L46 would have no affect on existing development below the West Side road, but there may have to be a minor adjustment to the 2L1 ROW at the angle near the north end of Alta Lake to avoid any reduction of the present screen of trees around the homes.

In DL 2246 all 3 lines traverse private land with high development potential if zoning were changed and adequate sewage treatment capacity was available. B.C. Hydro recognises the high potential of this block, as does the RMOW which has suggested that 2L2 and 5L42 be relocated from near the West Side road to close to 2L1.

As explained in Section 9.2(g) B.C. Hydro is not willing to relocate 2L2 and 5L42 at this time, but would be pleased to select the location for 5L46 through DL 2246 in conjunction with the land owner and RMOW to minimize the impact of the line on development potential and also to allow for future relocation of 2L2 and 5L42.

North of Nita Lake, 2L1 comes close to the subdivision above the West Side road. Here 5L46 would be located off the 2L1 ROW to the west, avoiding any affect on the subdivision.

Near Function Junction, and south of Highway 99, 5L46 would be located adjacent to 5L42. This would require a new ROW and clearing on developable land close to the Whistler Museum, sewage plant, and the service sheds at the start of the Cheakamus Lake Road. Assuming that the gravel pits near the municipal dump will ultimately have development potential, 5L46 would reduce that potential.

South of RMOW, the only restraint to land development related to 5L46 is the need for a new ROW through Brandywine Falls Provincial Park close to that of 5L42 on the eastern edge of the park. This intrusion would be compensated for by release of the 2L1 ROW through the core area of the park and the adjacent UREP to the north.

Forestry & Vegetation:

The forestry impact potential is assessed as moderate due to the divergence from the 2L1 ROW in the Green River valley and west of Whistler. The impact would be reduced if the sections of 2L1 ROW not used for 5L46 were replanted with conifers where it lies on the provincial forest lands.

Concern has been expressed over potential impacts to the wetlands in Whistler. It is appreciated that any work done should not change the hydrology of the wetlands. B.C. Hydro believes that if the work is done in the dormant season and the temporary access roads to each tower site are removed on completion of the work, the residual impact would be low.

Fish & Wildlife:

Wildlife viewing is a popular recreational activity at Whistler. The construction of 5L46 is not expected to cause any major long term changes to wildlife habitat, and would not change wildlife viewing opportunities. As the existing 2L1 ROW lies between 2L2 and 5L42 crossing the valley floor between Green and Alta Lakes no further clearing is required for 5L46 in this sensitive area. Some extra clearing would be required where the 2L1 ROW is used on the sidehills on either side of the valley and where 2L1 is not adjacent to the other lines. This clearing would not be in sensitive areas for wildlife.

Construction of 5L46 would have low adverse impacts on fish given the measures proposed for restoration of disturbed areas of the ROW and limiting clearing at stream banks.

Visual & Recreation:

Certain studies and plans are pertinent to the visual and recreation implications of transmission lines in the Whistler area. The Whistler Local Resource Use Plan was initiated in 1980 by the Ministry of Forests and the RMOW to address public concerns over the impact of forestry operations on recreation and visual values. The plan has produced 1:50,000 scale landscape inventory which identifies scenic influence zones, key viewpoints, sensitivity ratings and visual quality objectives to help visual management of forest harvesting. The transmission corridor through Whistler is identified as being almost entirely within the most sensitive scenic influence zone.

The Recreation Master Plan of the RMOW identifies key recreation areas and parks and numerous development and enhancement opportunities, mainly concentrated along the valley floor between the north end of Green Lake and where the Cheakamus River enters the main valley near Function Junction.

For ease of discussion Segment LN is sub-divided into three sections, namely:

- North of Green Lake (15km)
- Green Lake to Function Junction (14km)
- Function Junction to Daisy Lake (8km)

NORTH OF GREEN LAKE

Between Node L and the north end of Green Lake, landscape and recreation values are of moderate quality. 2L1, 2L2 & 5L42, Highway 99, the B.C. Railway and several gravel pits occupy the bottom of the Green River valley while the adjacent slopes have either been extensively logged or burned. There are no formal parks or recreation sites, and away from the highway, existing recreation use levels appear to be low.

Along the Green River there is good capability for river-side camping and hiking, and modest opportunities for fishing, especially north of Mystery Creek. Upstream from Mystery Creek, the valley narrows, partly the result of a major rock slide which holds interpretive value. In the upper section of the valley a series of rapids and chutes have some scenic value. Rock bluffs at the entrance to the Soo River Valley are used for climbing and are a visual focus from Highway 99.

For the most part, 5L46 would pose low to moderate impacts upon visual and recreation resources north of Green Lake.

For approximately 2.5km south of Node L, 5L46 would use a new ROW and is assessed to have moderate visual impact because of the exposure to northbound travellers. In this section, the existing 230kV line 2L1, which is frequently adjacent to the highway, would be removed. Visually, this poses some improvement although two other existing lines would remain close to the highway. The new ROW on a hillside to the east would be variously prominent or hidden from the highway depending upon terrain.

Southward, the remainder of the route north of Green Lake would have low visual and recreation impacts. From 2.5 to 7km south of Node L 5L46 would parallel 5L42. Only small portions of this line are visible from the highway and the net increase in visual impacts is expected to be low. A distinct benefit would be the removal of 2L1 which is quite prominent along 5km of Highway 99 in this section. From 7km south of Node L to the north end of Green Lake, 5L46 would occupy the 2L1 ROW which crosses the Wedgemount Glacier and Lost Lake (Wedge Creek) trails. Only a small, incremental impact is expected in this area due to extra clearing and greater visibility of the larger towers.

GREEN LAKE TO FUNCTION JUNCTION

Generally, throughout this section 5L46 would either be located on the existing 2L1 ROW or on a new ROW in an improved location. This section of Whistler has experienced considerable visual modification due to the highway, railroad, existing transmission lines, commercial, recreational and residential development. Normally, the replacement of a 230kV transmission line with a 500kV line in such an environment would pose relatively minor visual and recreation concerns, especially in a situation such as Whistler where development has allowed for the presence of the pre-existing transmission lines. However, the RMOW features such an extensive concentration of recreation and tourism activities and facilities that the area is highly sensitive in a visual sense.

The two types of possible impact in this section are:

(1) general impacts related to visual quality, and,
(2) relatively site-specific impacts upon recreation facilities or natural features.

The best mountain views in Whistler are from Highway 99, Emerald Estates, and Alpine Meadows looking east to Wedge Mountain and adjacent peaks. 5L42 comes close to intruding on these views where it is located on top of the ridge east of Green Lake.

5L46 would be located below 5L42 so it would not be intrusive, and by diverting from the 2L1 ROW near the lake, the present visual impact would be reduced as the varied and textured background of rock and vegetation would assist in reducing the visibility of the line. Incremental visual impact would be low.

At Mons and across the valley floor 5L46 would replace 2L1 and visual impact would be slightly greater as the towers would be larger than 2L1, but as 5L46 would lie between 5L42 and 2L2, the increment would be small provided that a flat conductor configuration similar to 5L42 were used.

The section of the segment from the north end of Alta Lake to the industrial area at Function Junction is the most visually sensitive part of the whole route, for in this section all three existing transmission lines (2L1, 2L2, & 5L42) can be viewed from a variety of points with differing levels of visual impairment.

When viewed from the ski hills the ROWs create a greater impact than the lines, because the regular linear clearing contrasts with the irregular background pattern of the vegetation, lakes and settlement. The ROWs are most visible when they are covered with snow and seen against the dark coniferous forest. 2L2 & 5L42 ROWs are more visible than that of 2L1 as they traverse a slope inclined towards the ski hills. The visual impact of all lines would be reduced by locating them on the bench near Beaver Lake where the lesser slope would reduce exposure, trees offer partial screening, and the lines and ROWs would be screened for some of their length behind the knoll south of Beaver Lake. This location is proposed for 5L46, resulting in moderate visual impacts when viewed from the ski hills, largely due to an increase in clearing width.

The transmission lines are visually intrusive when viewed from homes along the east side of Alta Lake, Alta Lake Park, and from developed areas near Whistler Creek. The most visible lines are 2L2 & 5L42 which traverse the slope above Alta and Nita Lakes. Only the tops of the wood poles and short sections of conductor of 2L1 are seen in this view. 5L46 would have taller structures and heavier conductors than 2L1, therefore where located on the 2L1 ROW more of the structures and conductor would be seen, but where behind the knoll, it would be hidden in views from the east.

The incremental impact in the views from the valley is considered moderate, provided a flat conductor configuration is used for 5L46, and much less than the impact of 2L2 and 5L42, except where a small group of homes is located within the angle of 2L1 at the north end of Alta Lake. Here the visual impact could be severe if the present screen of trees is much reduced. Retention of the screen may require adjustment of the angle point. Visual impact of this section could be reduced by use of a 'dulled' finish on the galvanized structures and the conductors to reduce reflection of light.

The subdivisions north and west of Alpha Lake are very close to all 3 transmission lines. 2L2 and 5L42 traverse the foreground of the view of most homes along the West Side road north of Alpha Lake. 2L1 is located to the west, and out of view of most of these homes. Location of 5L46 on the proposed route west of 2L1 would improve this situation.

From homes on the south side of Alpha Lake looking north, 2L2 and 5L42 are also in the foreground and 2L1 is more distant. Use of a new section of ROW for 5L46 to the west of 2L1 would provide a marked reduction in visual impact in this view.

The visual impact of the clearing for 5L46 as it descends to the 2L1 ROW east of Function Junction would be reduced if there was no road construction within the ROW. In addition the visual impact of the abandoned section of 2L1 ROW as it descends the same slope would be reduced by planting it with conifers and fertilizing them.

The crossing of Highway 99 adjacent to 5L42 results in a moderate increment in impact due to the increased width of clearing, although the 45° crossing angle is reasonably favourable. However, the clearing for 5L46 on the north side of 5L42 south of Highway 99 reduces the screen of trees behind the Whistler Museum, and the screening of the sewage plant from the road leading to the Cheakamus Lake trail and from two residences on the Cheakamus River, and makes 5L42 more visible on the west side of the river. The visual impacts are rated moderate.

It is recognised that the RMOW would favour relocation of 5L42 and 2L2 from near the west side of Alta, Nita, and Alpha Lakes to reduce visual impact when viewed from the east and southeast. Recognizing this long term objective, the proposed location of 5L46 is such that the total visual impact after relocation of all the lines would be minimized.

The main potential site-specific impacts are related to crossings of, or proximity to, existing parks and facilities, to important natural features and to potential recreation development areas. From north to south, these impacts are at:

- potential development of trails along the east side of Green Lake; the transmission line access road is used by snowmobilers and skiers,
- the Valley Trail along lower Fitzsimmons Creek,
- Balsam Park playground,
- Valley Trail at the River of Golden Dreams and the Whistler Cay area,
- kayaking and river trips along the River of Golden Dreams between Alta and Green lakes,
- wetlands and nature appreciation opportunities at the north end of Alta Lake,
- proposed enhancement and development at the north end of Alta Lake including the lower sections of the 21 Mile Creek/Rainbow Lake Trail and proposed development of Lot 2110 as a major heritage and waterfront park,
- development of a trail system along the west side of Alta Lake,
- lower portion of Mount Sproatt Trail,
- ATV use area southwest of Sproatt Creek,
- start of the Cheakamus Lake and Black Tusk Microwave Tower trails,
- possible development of kayaking activities and related parking lot on the Cheakamus River,
- snowmobile activity south of the Cheakamus River.

Generally, impacts of 5L46 upon the above listed areas would not be high, as except for the last 5 sites, 2L1 is simply being replaced by a new line, albeit with larger structures, and where present clearing is limited to that for a 230kV line, some extra clearing would occur.

FUNCTION JUNCTION TO DAISY LAKE

This section refers to the 8km along the Cheakamus River Valley to Node N at Daisy Lake. There are basically two homogenous units along this section: a 5km section of hilly upland terrain, and, to the southwest, a 3km section where 5L46 would cross a lowland unit containing the Cheakamus River and Daisy Lake.

The upland unit has rolling terrain. Extensive clear cuts occur in the northeast part while remnant areas of coniferous forest alternate with rocky terrain in the southwest part. The varied topography, varied forest cover and several small water bodies contribute to a moderately interesting landscape with good views towards Brandywine Mountain and other peaks to the west. The area has an extensive network of roads which are popular for driving, snowmobiling and cross-country skiing.

Visual and recreation impacts along this section are moderate. In the upland unit terrain and logged areas have good visual absorptive capability. However, 5L46 would pass over lands currently experiencing modest recreation use. Also, this area is viewed by the RMOW as important for future development for horseback riding, bicycling and cross-country activities because opportunities for those activities closer to the village are becoming congested.

Visual and recreation impacts in the lowland unit would also be moderate. A major concern of the Ministry of Parks is the creation of a new ROW through Brandywine Falls Provincial Park and the adjacent UREP, although this would be on the eastern edge of the park away from its main features. This impact would be significantly offset by the removal of 2L1 from the heart of the park and adjacent UREP.

In this section 5L46 would only be significantly visible from Highway 99 at the north end of Daisy Lake where it would cross the road at an angle. At this point, northbound travellers could glance northeast and see 5L46 crossing Daisy Lake and descending the distant hillside.

It should be recognised that use of the proposed route for 5L46 would result in the removal of 2L1 for 9Km where it follows Highway 99 on the southern approach to Whistler, a major visual benefit consistent with the objectives of the RMOW to have a high quality natural environment.

Heritage:

No significant sites are recorded, potential is primarily low with limited areas of low-moderate sensitivity.

Social:

The social impact of the project in Whistler is expected to be limited as work would be spread out over 5 years, and executed outside the winter period, work crews would be small, and increased heavy traffic would coincide with the lower periods of activity at Whistler, causing less congestion on Highway 99. It is anticipated that most project workers will stay outside Whistler, probably at Squamish. The West Side road at Whistler would be the local road most affected by construction traffic.

4.16 RAINBOW (MN) 23.0km

This segment requires a new separate ROW for its full length. It would be necessary for an access road to be extended south from the Soo valley logging road up the tributary valley to within about 1km of Rainbow pass. Helicopter erection would be used through the pass for about 2km, and an access road extended about 4km from the logging roads in the Callaghan Creek valley to construct the 4km section south of the pass. For the remainder the logging road system would provide adequate access apart from spurs to tower sites.

Terrain:

Rainbow Pass is a high elevation (1310 m) steep sided valley. The side slopes are composed of exposed bedrock with extensive talus and scree deposits along the lower slopes. On the northeast side of the pass avalanche tracks extend to the valley floor. Although the pass is narrow and avalanche hazards exist on either side, it is considered, after inspections in all seasons, that there is a safe route for a transmission line, although some protection for structures would be necessary.

The impacts of road construction in the pass would be high and could create instability in the many scree and talus deposits.

On the south side of the pass the terrain quickly becomes more gentle, slopes are less, and surficial deposits are deeper. There are fewer hazards. However there are many deep gullies cut by small streams and the impact of an access road in crossing these could be high.

Once into the logged areas of Callaghan Creek the terrain is much easier and impacts would be low.

Land Use & Agriculture:

The route is entirely on forest land, apart from the 3km through the pass. The pass is an important focus of recreation activity.

In July 90, the Ministry of Crown lands called for proposals for development of Crown land in Callaghan Valley. This proposal identified 3 potential development zones for alpine skiing, nordic skiing/residential, and golf course/residential.

The Rainbow segment would traverse 2km of the nordic skiing / residential zone, 1km of the eastern fringe of the alpine skiing zone, and 8km through the centre of the golf/residential zone. The terrain of the golf/residential zone is very suitable for development.

The transmission line would seriously distract from the visual appeal of this zone and complicate development planning.

Forestry & Vegetation:

The potential forestry impacts are assessed as high due to loss of productive growing sites and immature growing stock in logged areas. The vegetation of the pass and adjacent areas is important for aesthetic reasons, given present and future recreation use.

Fish & Wildlife:

The impact potential on wildlife is assessed as moderate, largely due to disturbance of deer range in southern portion.

Impacts on fish would be very limited.

Visual & Recreation:

The segment passes through an area of growing recreation importance. It crosses a series of trails linking Alta, Rainbow, Madely and Callaghan lakes. Logging in the Callaghan River valley and a nordic ski area near Callaghan Lake have resulted in good road access for recreationists throughout much of the Callaghan Creek drainage.

This general area features good opportunities for viewing, wilderness travel, hiking, snowmobiling, cross-country skiing and camping. The Rainbow Mountain area is a relatively easily accessed, high quality alpine unit favoured by mountain bikers but mostly used by hikers. Similar terrain continues westward to Callaghan Lake which borders an extensive area of highly dramatic mountains to the north, west and south. Alexander Falls is an attractive feature on a tributary of Callaghan Creek near the road to Callaghan Lake.

Recreational use in the area has grown considerably in recent years. The Ministry of Forests have recorded 3,500 user visits annually in the Callaghan Lake area (Ministry of Parks, 1988). Such estimates are usually considered conservative. Individuals use trails in the north and roads in the south to enter the area while businesses catering to a variety of winter and snow recreation activities use the roads and helicopters to exploit opportunities at Brandywine Mountain and near Callaghan Lake.

The adjacent alpine areas are viewed by the Ministries of Forests, Crown Lands, and Parks as serving an important role in the future expansion of recreation and tourism based at Whistler. The recent Whistler - Pemberton Commercial Backcountry study undertaken for the Ministry of Crown Lands indicated that the Rainbow/Callaghan/ Pemberton Icecap alpine area represented the best opportunity for expansion of commercial backcountry activity. The Callaghan Creek valley was identified in the study as one of the best access routes to this area which is already heavily used for recreation access. It is particularity well suited for snowmobile access to the alpine areas.

To date, planning for this area is not complete. There is considerable interest in establishing parks and additional facilities by the RMOW, Ministry of Parks and Ministry of Forests. A number of reserves and proposals have therefore been put forward including UREPs or recreation reserves at:

- Rainbow Falls
- Rainbow Mountain
- Showh Lakes
- Madely Lake
- Callaghan Lake

The Ministry of Parks have proposed a 10,000 ha recreation area, including Callaghan Lake, Powder Mountain and Mount Callaghan, be developed for both vehicle and walk-in camping, hiking and wilderness activities. The Ministry of Parks will continue to seek protected status for these areas for which development proposals are not received. At the same time, the Ministry of Forests are continuing to improve and develop the trail system in the Rainbow Mountain area.

The segment traverses the area identified in the Ministry of Crown Lands proposed call for development for the Callaghan Valley as suitable for golf for 8km from north to south. As most of this zone has been clear cut, the transmission line would be highly visible from any adjacent golf course.

5L46 would avoid the most attractive landscapes and features, but would cross several trails and access routes such as the Soo Valley and Callaghan Lake roads, Madely Lake, Brandywine Creek and Brew Lake trails.

North of Alexander Falls, visual and recreational impacts would be high. The ROW in this area would contrast sharply with the existing closed forest canopy and 5L46 would be visible from important alpine areas in the adjacent mountains. A transmission line in Rainbow Pass and its approaches would conflict with the "wilderness" qualities associated with the alpine areas near Whistler which are used to enhance its appeal as a recreation destination.

Heritage:

No sites are known, potential is considered low to low-moderate.

Social:

There are no specific social impacts associated with use of this segment given the present level of development. The Callaghan forest road would receive the most of the traffic.

4.17 UPPER CHEAKAMUS (NP) 12.8km

In this segment the route uses the 2L1 ROW south from Node N for 9km to the head of the Cheakamus Canyon. There the route jogs west to cross 2L2 and continues south on the west side of the canyon rising for 2km on new ROW over an exposed ridge. It then descends for 2km to node P near Butterfly Lake.

Terrain:

Access along the 2L1 ROW is adequate. Helicopter construction, using an assembly area with good road access, would be used to construct the section west of the canyon and to avoid construction of roads in the exposed rocky terrain near Butterfly Lake. The access road to the latter might be used to bring in some materials and work crews.

Land Use & Agriculture:

There are subdivisions at Black Tusk Village and Pinecrest Estates along the west side of the combined 2L2 and 2L1 ROW. Replacement of 2L1 by 5L46 would have little impact as it is the line furthest from the homes. Both subdivisions postdate the transmission lines.

Development on the valley floor near Daisy Lake is prohibited by Order in Council 1409 which declared the land to be within a "Slide Hazard Area" as a result of its past exposure to slides originating from the Barrier in Rubble Creek valley. The use of land within the hazard area for transmission lines is permitted.

Butterfly Lake, perched high above the Cheakamus Canyon, has been developed for recreation cabins with about 24 cabins dotted round the lake. Access is by a rough road up Pillchuk Creek from the Squamish River valley. Although close to it, 5L46 would not be visible from the subdivision, because of an intervening rock ridge, but may be visible as it climbs over the ridge 1km to the north.

Forestry & Vegetation:

Potential forestry impacts are assessed as low due to use of the 2L1 ROW and the low productivity of the rocky terrain west of the Cheakamus canyon. The trees on this terrain, though stunted, are important aesthetically and should be retained wherever clearances are adequate.

Fish & Wildlife:

Potential impacts are assessed as low due to the terrain and use of 2L1 ROW.

Visual & Recreation:

From the north end of Daisy Lake to the head of the Cheakamus canyon (8km) visual and recreation impacts are moderate as 5L46 would replace 2L1.

Where 5L46 diverts from 2L1 and ascends the ridge on the west side of the canyon to about 400 m above the highway, it would be exposed to south bound travellers on Highway 99. When viewed from close to the foot of the ridge, the highest tower would be seen on the skyline. This represents a high visual impact but is considered acceptable in that the view of the ascent from the highway is severely limited by the trees along the highway, and because the removal of 2L1 from the north end of the canyon brings much improvement to a very congested and visible area.

Concern has been expressed about possible impacts of the route on the west side of the Cheakamus on the remarkable view of the Tantalus Range from a well established viewpoint on Highway 99. Given the broken nature of the terrain on the west side of the Cheakamus Canyon, where 5L46 would have to traverse a highly glaciated landscape of rock knolls with scattered patches of trees growing in the gullies between them, it is very hard to determine how the line would be seen until a survey is done. From inspection from the air it is considered that a route exists which would permit 5L46 to be hidden from the viewpoint. At worst, the tops of some towers and portions of conductor spans only would be seen. The potential visual impact is estimated at this time to be high.

Heritage:

Because no sites are known the potential impact is considered to be low.

Social:

The social impacts in this segment would be disturbance at Black Tusk village, Pinecrest Estates and Butterfly Lake cabins during construction, including extra traffic on the highway passing the subdivisions.

4.18 LOWER CHEAKAMUS (PQRT) 13.7km

In this segment the route uses a new ROW from node P to Q (2km) and from there through node R to T follows the 2L1 ROW. The PQ section would be constructed by helicopter, no new access roads are required for the remainder.

Three suboptions are also to be considered in this segment; PR on the west side of the Cheakamus River valley; RSZT in the southern part of the valley; and QS on the east side of the valley.

PR requires a new ROW for its full length, and given the nature of the terrain, helicopter construction would be necessary.

RSZT requires new ROW for its full length. Helicopter construction would be used for the ascent of the bluffs east of the Cheakamus River, elsewhere old logging roads would provide access.

QS requires a new ROW for its full length. While most access could be developed from Highway 99, some helicopter construction might be necessary.

Terrain:

The route south from node P for 2km traverses heavily glaciated rocky hummocks with deposits of colluvium between the hummocks and occasionally morainal deposits. Thereafter it is on the fluvial deposits of the flood plain except close to Cheekye where it crosses the extensive fan of the Cheekye River which has been built up by a series of debris flows from the upper part of its drainage.

PR traverses the steep slopes on the west side of the valley. Steep exposed bedrock is dominant with coarse morainal and colluvial veneers over less steep areas. Impacts from road construction would be high.

RSZT rises from the flood plain of the Cheakamus River to follow gullies between rocky ridges on the east side of the river before meeting 5L42 and descending on to the Cheekye River fan. Some old logging roads exist for access. New roads would be difficult to construct.

QS traverses rocky slopes on the east side of the valley very similar in nature to those described for PR.

Land Use & Agriculture:

The lower Cheakamus valley is an area of scattered rural residential settlement. From node Q south for 2-1/2km the area is outside the District Municipality of Squamish, further south it is within the municipality. The Official Community Plan envisages continuation of rural development in the valley. All residents outside the municipality depend on use of B.C. Hydro's service road to access their properties. This has been upgraded over the years and within the municipal boundary it is now maintained by the municipality. Beyond the boundary there have been a series of disputes regarding maintenance of the road and its bridge across Culliton Creek.

There are 3 centres of settlement in the valley. A scattered group of homes exist for 5km south of node Q. A cluster of 25 to 30 houses exists on Midnight Way north of node R. The North Vancouver Outdoor School has a complex of buildings in DL 1244.

Further south there are one or two homes near the ROW on the Cheakamus Indian Reserve. After crossing the Cheekye River the ROW crosses several undeveloped lots in DL 1817. A riding stable uses the ROW near Cheekye for corrals and trails.

If the ROW between nodes Q and T were not used, about 72 ha of valley bottom land could be available for development. The area required for the access road ROW could amount to 23 ha assuming a 20m wide ROW. However at this time there is plenty of land available for development off the ROW, so limited availability of such land is not a factor for moving off the existing ROW.

The North Vancouver Outdoor School buildings are very close to the 2L1 ROW which is used for playing fields and for grazing some farm animals. If 5L46 were constructed on the 2L1 ROW it would be necessary to clear some of the trees on the edge of the ROW, exposing the school further to view from the road. Any desire to shift 5L46 further away from the school buildings is limited by the proximity of the road to the west. 5L46 would represent a major intrusion in the atmosphere of the school.

Sub-options PR and QS are both on sidehill and have no influence on land use in the valley.

Segment RSZT allows a diversion round the North Vancouver Outdoor School and the Cheakamus IR. It requires a new ROW on undeveloped lots in DL 1817 which are presently forested.

Forestry & Vegetation:

The potential forestry impacts are assessed as high because of the productivity of sites on the floodplain even though the existing ROW has been cleared. Use of the sidehill routes would reduce these impacts as the sites are of lower capability.

The 2L1 ROW is in a mature state. While not yet perfect in terms of vegetation control the ROW, in its present state, is a valuable asset to B.C. Hydro.

Fish & Wildlife:

The use of sub-options PR or QS could result in erosion from the steep cleared ROW causing siltation in the Cheakamus River which has an important sports fishery.

The lower Cheakamus valley is known for its concentration of bald eagles in late fall as they feed on the salmon carcasses. Loss of mature trees along the river should be avoided, as should disturbance from mid-winter to early spring. Sub-option PR requires clearing of trees at one crossing of the Cheakamus River. Sub-option RS requires clearing through a stand of mature deciduous trees on the floodplain which may be of importance to the eagles.

Visual & Recreation:

A preliminary inspection has been made of the ROW in the lower Cheakamus valley. The present clearing width is not adequate for a 500kV line although the outage record of 2L1 is excellent. As virtually all homes lie on the west side of the ROW, the conclusion was reached that to prevent cutting of the present screen of trees between the clearing and homes, it would be preferable to obtain more ROW on the east side and move the line to the east far enough so that the present western edge of the clearing, less danger trees, remains the western edge of the cleared area for the new line. If this were done, the present level of screening for each home would remain virtually the same for the new line, causing a low level of impact. If current standards are met, 5L46 would have to be moved an estimated 22m to the east. This may be reduced when final line design and clearing requirements are determined.

Use of sub-option PR would result in severe visual impact as 5L46 would be highly visible from viewpoints on Highway 99 against the background of the Tantalus Range creating potential for high to severe visual impact.

Use of sub-option RSZT would have a moderate visual impact between nodes R and S where the line would ascend the bluff on the east side of the Cheakamus River in one span. Along the remainder of the route 5L46 would be hidden from Highway 99, Brohm Lake, and the Cheakamus valley. Brohm Lake is presently a Ministry of Forests recreation site, but is proposed for a Class A park. The exact boundaries of the proposed have not been established. RSZT could intrude into the western part of any park.

Use of sub-option QS would result in 5L46 being close to Highway 99 and highly exposed at the viewpoints looking west to the Tantalus Range creating potential for high to severe visual impact. QS would definitely intrude into any park developed at Brohm Lake.

Heritage:

Use of the existing 2L1 ROW would make no change to known heritage resources. There is the potential of finding more sites in this area during construction.

Sub-option PR is in an area of primarily low potential. Sub-option QS has low to moderate sensitivity in portions. To the east of node R, however, is an important site, which features in the myths of the Squamish Indian people. The site is called "Wountie" and it is associated with a rock face overlooking the river which marks the spot where the Transformer turned one of 2 brothers into stone. The location of 5L46 relative to this site would require discussion with representatives of the Squamish Band during design, but it is believed that suboption RSZT avoids the location, or can be adjusted to avoid it.

Social:

The significant social issues in the Lower Cheakamus section are the location of 5L46 relative to the North Vancouver Outdoor School, the concern of residents in the Cheakamus valley regarding EMF, possible interference with the mythological site, and the future of the B.C. Hydro service road which would be used for most of the construction traffic. In addition there is a dispute between the Squamish Indian Band and B.C. Hydro over the validity of the latter's ROW for 2L1 over the Cheakamus Indian Reserve.

4.19 ORE (UV) 38.0km

This segment requires new ROW for its full length, with extension of forest roads in the Leon Creek and Ore Creek drainages. It is remote from other transmission lines.

Terrain:

Construction on the steep terrain in Ore Creek valley and the Yalakom River valley is likely to result in moderate to high impacts.

Land Use & Agriculture:

Clearing of the ROW in the Leon Creek drainage area, and the grazing units west of node U, would increase grazing potential.

In the Yalakom River valley the route is close to, but not on, the agricultural land. Impacts would be low.

The route crosses some 4km of private land in the Yalakom River valley, some with development potential but currently owned by members of a community dedicated to preserving the rural values of the area. It also crosses several creeks licensed for domestic water supply in this section.

Forestry & Vegetation:

Forestry impacts would be high for the 20km in the McKay and Leon creek drainages as timber values are high. Low to moderate impacts are anticipated in the Ore Creek and Yalakom River drainages.

Vegetation impacts would be high in the Ponderosa Pine zone in the Bridge River valley and in the high elevation sites near Mount Birch in the Engelmann spruce - subalpine fir zone where revegetation of disturbed sites is very slow.

Fish & Wildlife:

The impact of this segment on wildlife would be high, mainly because of the crossing of the Camelsfoot Range and the Ore Creek drainage which would adversely affect habitat for bighorn sheep, mountain goat, deer and moose due to provision of more road access and disturbance. It is understood that the pristine areas of the Camelsfoot Range and Ore Creek drainage currently provide habitat for grizzly bear, wolverine, fisher, and other animals relatively rare in southern B.C.

The segment crosses known deer winter ranges in the Yalakom and Bridge river valleys.

Visual and Recreation:

Potential impacts are low except in Yalakom and Bridge River valleys (11km) where they are assessed as high. Of particular concern are the crossing of the Yalakom River valley and entrance to the Bridge River canyon.

Heritage:

The segment crosses a village site with very high heritage significance near node U. The eastern end near node U has high heritage potential as do sections in the Yalakom and Bridge River valleys.

Social:

Construction in this segment would bring increased traffic to the Yalakom Forest road. The route is not near permanent homes, but may be near recreation cabins on the west side of the Yalakom River valley.

4.20 BRIDGE (F1X) 19.0km

This segment requires new ROW for its full length. Helicopter construction may be required in some sections of the steep terrain of the upper part of the Applespring Creek drainage (4km). Access roads would be developed for the remainder.

Terrain:

Potential impacts in this rugged terrain are assessed as moderate to high with particular concern for potential for instability in the Applespring Creek drainage, and the difficulty of restoration of disturbed areas on the steep dry slopes between Applespring and Antoine creeks. Helicopter construction would be necessary to limit impact at the descent on the east side of Applespring Creek, and at some very site specific locations along the Bridge River section.

Land Use and Agriculture:

Clearing for the ROW would increase grazing potential in the grazing lease on the east side of the Camelsfoot Range.

The route crosses private land near Antoine Creek and is close to Bridge River IR1 and private land near Applespring Creek.

It crosses licensed water supplies in Black Hill, Applespring and Antoine Creeks.

Forestry and Vegetation:

Forestry impact potential is low due to the rugged nature of the terrain. Vegetation impact would be moderate to high due to a number of sensitive, slow to revegetate, and high erosion potential sites occurring in the dry forest zones in the Bridge River valley, and the steep terrain of the Applespring Creek drainage.

Fish & Wildlife:

The ungulate habitat in this segment has a high capability rating for its full length. The impact potential of line and road construction is rated as high.

Visual and Recreation:

Visual impact is rated moderate for the ascent of the east side and crossing of the Camelsfoot Range (6.5km) due to the limited new clearing that would be visible from the main transport corridor.

The impact between Applespring and Antoine Creeks (12km) is rated as severe because of the highly exposed ROW clearing at mid slope elevation through the distinctive savannah type forest and grassland of the Bridge River valley. Use of access roads for this section would increase visual impact, as the arid conditions make restoration very slow. This section of the Bridge River has high significance as a representative landscape with high recreation appeal and ecological interest.

Heritage:

Impact potential is low, except for short section near Moha.

Social:

Construction would bring a significant increase in traffic to Bridge River and Fraser West Side roads.

4.21 EAST PAVILION (WW1DE) 11.8km

This segment requires a new ROW separate from other transmission lines. The segment bypasses Pavilion IR1 on the east and south sides.

Terrain:

Section W1D crosses the well known Pavilion flow slide but would not require a tower on the slide.

Section DE has the same impact potential as described earlier for the sub-option CDE of the Pavilion segment; a new access road across a silty glaciolacustrine terrace would have high impact potential.

Land Use and Agriculture:

The route crosses much private land in the Pavilion River valley and on the benches east and west of the Fraser River.

The line should not interfere with agriculture on the narrow Pavilion River valley floor, but could affect irrigation on the benchlands on either side of the Fraser.

Forestry and Vegetation:

Potential forestry impacts are low due to the dryness of the area. Vegetation impacts are assessed as moderate to high due to the number of dry sensitive sites on steep slopes which are difficult to revegetate.

Fish & Wildlife:

The wildlife impact potential is assessed as moderate due to the traverse of ungulate habitat throughout the segment and for the possible disturbance of the bighorn sheep range in the Fraser Canyon.

Visual and Recreation:

High visual impacts are anticipated in the Pavilion River valley due to the crossing of Highway 12 and B.C. Rail. The line would also be visible from Pavilion Village. Helicopter construction should be used on north side of Pavilion River valley to reduce visual impact of road construction on those bare slopes.

The impacts in the Fraser Canyon are severe as described for suboption CDE of the Pavilion segment.

Heritage:

There are no known sites on the route but there is considerable heritage potential along the whole segment.

Social:

The opinion of the Pavilion Indian Band on this route is not known. Portions of it would traverse the view from Pavilion Village.

4.22 SOUTH PAVILION (W1F1) 8.5km

This segment requires new ROW for its full length and is separate from other transmission lines. The segment provides a second way of bypassing Pavilion IR1.

Terrain:

Potential impacts are rated medium to high because of the unstable terrain on both sides of the Fraser Canyon.

Land Use and Agriculture:

The route crosses private lands near node W1 and on the bench east of the Fraser River which are used for ranching.

The route crosses 2km of ALR land near node W1 and on the bench on the east side of the Fraser. Potential impacts are low to moderate depending on whether irrigation would be used.

Forestry and Vegetation:

The potential impact on vegetation is moderate to high, because the sensitive sites on steep slopes in dry areas would be difficult to revegetate if disturbed.

Fish & Wildlife:

The route traverses range on the east side of the Fraser River with good capability for deer and bighorn sheep. The latter have recently been observed on the bench near the route. There is concern regarding possible disturbance of the sheep.

Visual and Recreation:

The visual impact of the crossing of the Fraser Canyon is assessed as severe due to the bareness of the benches near the highway and railway, the exposed location for crossing the three transmission lines on the east side of the Fraser, and the exposed ROW on the steep slopes of the east side and west side of the canyon.

Heritage:

There is high heritage potential on the bench on the east side of the Fraser River.

Social:

This route is visible from Pavilion Village in the middle distance. It does not come near other areas of settlement.

4.23 SETON (G1G2) 5.5km

This option requires a new ROW as it bypasses Seton Lake IR5A.

Terrain:

The route crosses steeper, more exposed terrain than the alternate.

Land Use and Agriculture:

No anticipated impacts.

Forestry and Vegetation:

Potential forestry impacts are similar to the alternate. Vegetation impacts are moderate, but higher than the alternate as slopes are steeper.

Fish & Wildlife:

Impact potential is assessed as low to moderate.

Visual and Recreation:

Because most of the route is out of sight from the valley floor, the impact potential is low. However, from certain higher viewpoints such as Mission Ridge the route would have higher impact than the alternate due to additional clearing separate from the existing ROW.

Heritage:

Route has low heritage potential.

Social:

No differences to alternate are anticipated.

4.24 D'ARCY (H1H2) 13.5km

This option requires a crossing of Anderson Lake (1.3km span) and a new ROW around the east side of the community to bypass Nequatque IR1 and Anderson Lake IR5.

Terrain:

Potential impacts are low. Some terrain hazard exists on fluvial fans of Haylmore and Johns creeks.

Land Use and Agriculture:

The crossing of Anderson Lake would be in full view of all waterfront homes at D'Arcy. The south end of the crossing would be very close to a recreation subdivision on the east side of Anderson Lake.

The route is close to private land for 3km on the east side of D'Arcy and for 2km crosses private land south of D'Arcy.

There are no potential agricultural impacts.

Forestry and Vegetation:

Potential vegetation and forestry impacts are low to moderate and comparable to those of the alternate.

Fish & Wildlife:

Potential impacts on wildlife are assessed as moderate due to indirect impacts on wildlife from improved access.

Visual and Recreation:

D'Arcy is an important recreation centre due to its location as a road terminus, its historic interest, and development potential. The view along Anderson Lake from the D'Arcy waterfront is very scenic.

The visual impact potential of the lake crossing is assessed as severe due to the quality of the view and the high use of the waterfront. The remainder of the route has moderate impact as it is generally screened by trees.

Heritage:

Potential for heritage sites varies from high (north side of lake) to moderate (south side of lake and creek crossings) to low (remainder).

Social:

Construction would bring disturbance to properties on the east side of D'Arcy not affected by the alternate.

4.25 LOKLA SUBOPTION 0.5km

This is a short diversion around the south east corner of Lokla IR4. New ROW would be required in an area congested with two transmission lines, highway, and railway.

Terrain:

The southern end of Lokla IR4 is covered by debris from a rock slide of the slope to the south. The present ROW is over this. The suboption avoids this rock slide and stays on the valley floor. Potential impact is low.

Land Use and Agriculture:

Use of the suboption would not increase the utility of the reserve unless the slide debris were moved.

The suboption would have no impact on land use or agriculture, but requires new ROW on DL957.

Fish & Wildlife:

No impact is foreseen.

Visual and Recreation:

Visual impact potential would be low because existing lines are already close to highway.

Heritage:

There is potential for a heritage site at the new crossing of Birkenhead River.

Social:

No impacts are anticipated. Reserve is used in fishing season and campsite is west of 2L1 ROW.

4.26 FUNCTION (Y1Y2) 3.3km

This option uses the 2L1 ROW for 1.7km along the north side of the industrial/service area at Function Junction and requires new ROW for 1.6km across the highway, railway, Cheakamus River, gravel pits and dump.

Terrain:

Impacts would be low.

Land Use and Agriculture:

Where the suboption is on existing ROW near the industrial area no conflicts are anticipated.

The crossing of the highway and railway has no associated land use problems.

The route over the gravel pits and dump has no conflicts provided it is routed where gravel has been extracted. Use of the suboption reduces constraints on expansion of the sewage plant.

There is no agricultural activity in the area.

Forestry and Vegetation:

The suboption requires cutting of some mature deciduous trees at the highway crossing but avoids further cutting of the remnant attractive stand of mature conifers behind the Whistler Museum which forms a pleasing backdrop to the main entry to Whistler.

Fish & Wildlife:

The suboption uses existing ROW along Miller Creek, therefore should have low aquatic impact.

The wildlife impacts would be negligible due to adjacent land uses.

Visual and Recreation:

Where 5L46 would be on the 2L1 ROW it would be fully visible from the industrial area, as is 2L1. The visual impact would be incremental due to the larger structures and conductors. This section is well screened from the highway.

The angle tower at the highway crossing would be visible, but as it is high above the highway it is on the fringe of the field of view for travellers on the highway. The highway crossing is at about 90° to the highway which is a favourable angle. The tower is so high on the north side that only very tall trees would require clearing on that side which is the more visible outer side of the curve in the highway. As a result the visual impact of the crossing would be low.

Heritage:

The suboption avoids site EaRs1. There is moderate potential at the Cheakamus River crossing.

Social:

This suboption was proposed by a resident of Whistler with property facing west along the Cheakamus River. Use of the suboption would reduce the visual impact of 5L46 when viewed from his property.

4.27 CALLAGHAN (N1Y2) 6.7km

This segment requires new ROW separate from existing transmission lines but requiring a crossing of 2L2, 5L42, and possibly 2L1.

Terrain:

The segment crosses gravel benches and rocky slopes in the Callaghan and Cheakamus valleys, impacts would be low.

Land Use and Agriculture:

There is no agricultural interest. The suboption traverses the eastern edge of an area in the lower Callaghan Creek valley which the Ministry of Crown Lands has identified as suitable for golf/ residential and for which it has invited development proposals. If this land is developed the presence of the transmission line would affect the pattern of development.

On the east side of Highway 99 the route crosses a portion of the basalt quarry used by B.C. Rail to provide rail ballast.

Forestry and Vegetation:

Potential forestry impacts are high due to the productive sites in the Callaghan Creek valley, which has mostly been logged in this area but supports a good stand of second growth forest.
It would be desirable to protect the stand of mature conifers at the junction of Highway 99 and Callaghan Lake road. Other vegetation impacts would be low.

Fish and Wildlife:

Potential wildlife impacts would be low, because the area has already been accessed by logging roads and because of the proximity to the highway.

Visual and Recreation:

Recreation impacts would be low except that the junction of Highway 99 and the Callaghan Lake Road is already an important focus of recreation traffic and recreation traffic on both roads will grow steadily.

Visual impacts are anticipated to be moderate provided that the crossing of 2L2, 2L1 and 5L42 can be kept low so that 5L46 would not intrude into the southwards view of the mountains for southbound travellers on the highway.

Heritage:

There is moderate heritage potential at the Cheakamus River crossing.

Social:

The segment is not near any homes. Construction on this route would bring much more traffic to Callaghan Lake road.

4.28 HIGH CHEAKAMUS (YZT) 36.6km

This route requires a new ROW separate from any transmission line for 32.8km south of Y, although for 18km it is usually not far from 5L42. For the final 3.8km it is located adjacent to 5L42.

Terrain:

The route lies over rugged, rocky terrain with many steep slopes. Existing logging roads would provide most of the necessary access, but a section over rock bluffs near Brohm Lake would require helicopter construction. Potential impacts would be low to medium provided helicopters were used in the difficult section, as done for 5L42. The flood hazard of Cheekye River can be avoided by locating structures on rock outcrops.

Land Use and Agriculture:

The route lies on forested Crown Land from node Y to the turn into Cheekye. Private land is crossed at DL2660 near Culliton Creek, and is close to the route at DL2605 and DL424 in the Swift Creek valley. These last developed lots would be bypassed on their eastern side.

The final 2km crosses private land on the Cheekye River fan. Two homes are close to the route in DL1818 and an undeveloped subdivision exists in DL1817 on the east bank of the Cheekye River. The Cheekye Stables riding operation is based partly on the proposed ROW near Cheekye.

The route crosses the new extension of Garibaldi Provincial Park along Rubble Creek for 1.5km.

There is no agricultural interest along the route.

Forestry and Vegetation:

Potential forestry impacts are rated low to moderate as the route crosses mostly sites rated poor, and many sections have been, or will have been logged, by the time construction starts.

Vegetation impacts would be low to moderate as not many sensitive sites occur on the route.

Fish & Wildlife:

The route provides CL1 class 4 and 5 habitat for deer with some class 3 at lower elevations. Impacts would be low as the ROW would create habitat diversity.

Visual and Recreation:

Use of a route high on the east side of the Cheakamus River valley distances the line from the traveller on Highway 99 and in many areas lifts the line above the general line of sight of the traveller. Due to broken nature of the terrain, the line is often also screened from view from the highway and the diverse vegetation patterns also help to reduce the visual impact. In general, the visual impact of the line is low to moderate. However, sensitive areas occur at Pinecrest, Rubble Creek, Cheakamus Canyon and south of Swift Creek. These are discussed separately.

Residents of Pinecrest were concerned that 5L46 would intrude into their eastward view to the Black Tusk. The line was deliberately located east of the break in slope of the valley wall to conceal it in this view. Computer simulation has determined that the ground of the ROW would not be visible from Pinecrest and that the visible portion of the line would be the top of one tower with about one span of conductors in total arranged on either side of it, all seen at a distance of 3km.

The crossing of Rubble Creek valley is a very sensitive site as it requires a crossing of an extension to Garibaldi Provincial Park which is the major access route to this popular route. In addition MOP staff are sensitive to the visual impact of the line when viewed from the park, and to any restraint imposed by the line on their use of helicopters in the Rubble Creek valley as this is their major aerial supply route to the alpine areas.

Computer simulation of the view west from the Black Tusk shows that the line would be visible for approximately 870 M in undulating terrain. The ground of the ROW would be visible for only 430 M, but the conductors and the top edge of the clearing would be visible for 870 M. The level of impact is considered acceptable when viewed against the pattern of logging.

At the crossing of the Rubble Creek extension of the park several route options are being reviewed and are to be tested by computer simulation. Additional visual simulation work, and discussion with MOP staff, continues in an effort to determine a mutually acceptable route.

Between Rubble Creek and the head of the Cheakamus Canyon 5L46 would be exposed to the valley on side hill but is screened from Highway 99 by the tall trees on its east side.

At the head of the canyon a tower of 5L46 would be skylined when viewed from the south on Highway 99.

South of Swift Creek 5L46 would traverse 2km of very steep side slope with very limited tree cover. The visual impact would be reduced if helicopters were used for construction to avoid the use of access roads.

Depending upon the solution achieved at Rubble Creek, visual impact is assessed as low to moderate.

Heritage:

Low heritage impact is anticipated.

Social:

Impact of construction would be low as the route is well separated from settlements. Traffic on Highway 99 would be as for alternate route.

4.29 PINECREST (Y1N2P1) 23.0km

This route requires 3.5km of ROW adjacent to 2L2 then new ROW separate from any transmission line for 19.5km

Terrain:

The route lies on the slopes of the west side of the Cheakamus River valley except for its crossing of the Callaghan River Valley (21km) and the Cheakamus River valley (2.5km). The side slopes are steep and rocky with shallow morainal veneers and colluvial deposits. With careful tower location no terrain problems are anticipated. Suboption YN2 crosses the Cheakamus River valley floor.

From south of Shadow Lake for 1.5km the route crosses the deposition area of slides originating in Rubble Creek where towers would be at risk.

Land Use and Agriculture:

The route crosses 4km of the zone identified as suitable for golf/residential at the mouth of the Callaghan Creek valley by the B.C. Ministry of Crown Lands. At its south end the segment crosses the Cheakamus River valley floor in the vicinity of the remnant community of Garibaldi where development is prohibited because of the hazard

There is no agriculture on the route.

Forestry and Vegetation

Forestry impact potential is rated moderate, as much of the forest land is of poor site quality with only limited stands of mature forest.

Vegetation impacts are low-moderate as no areas of particular interest occur.

Fish and Wildlife:

Impact potential on wildlife is low due to proximity to existing transmission lines, Highway 99, B.C. Rail, logging and other access roads, and recreation activity.

Visual and Recreation

The impact of the segment is rated high because of the proximity to Highway 99, the conflict with recreational use in the Callaghan River valley, impacts on Brandywine and Brew Lake trails, proximity to Shadow, Stanley, and Lucille Lakes, and interference with B.C. Hydro's recreation area at Shadow Lake.

Suboption YN2 has moderate impact due to its interference with the Cal-Cheak recreation site and proximity to UREP 1-7-3-85.

Heritage:

The segment has low impact potential.

Social:

Construction would create less activity near Pinecrest and Black Tusk Village than use of Upper Cheakamus route, but more than use of High Cheakamus route.

4.30 PINECREST EAST (YN2) 5.0km

This route requires 5.0km of new ROW of which 2.7km is adjacent to 5L42.

Terrain:

The route crosses the easy terrain of the floor of the Cheakamus River valley.

Land Use and Agriculture:

There is no agriculture in the area. There is no development along the route and no land use conflicts.

Forestry and Vegetation:

Impact potential is rated low for both forestry and vegetation.

Fish and Wildlife:

Impact potential for both wildlife and fish is low.

Visual and Recreation:

The route cuts across the access road to the MOF Cal-Cheak recreation site, which is very popular, without impacting the site, although the total area of old growth forest would be reduced.

The greatest visual impact is at the crossing of Highway 99 as 2L2 would also have to be crossed adjacent to the highway.

Heritage:

The segment has low impact potential.

Social:

Use of this route would reduce visual clutter of transmission lines along Highway 99, relative to Pinecrest route.

5.0 ENVIRONMENTAL INFORMATION FROM PUBLIC CONSULTATION

5.1 GENERAL

This section deals briefly with issues raised by the public through the public consultation program and the social impact consultant (Urban Systems Ltd.) that are relevant to the assessment of the route options and preparation of an environmental management plan for the design, construction, and operation of the project.

The issues discussed in this section are drawn from the following reports prepared for the public consultation program and for social impact, namely:

- Synergistics Consulting Ltd.,
  Kelly Lake to Cheekye Substation, Second 500 kV Transmission Line, Public Consultation Report,Phase One and Two, March 1991.

- Urban Systems Ltd.,
  Kelly Lake-Cheekye 500 kV Transmission Line Environmental Studies,
  Land Use/Socio-Economic Component, March 1991.

5.2 ENVIRONMENTAL ISSUES RAISED THROUGH PHASES 1 & 2 OF PUBLIC CONSULTATION PROGRAM

The following environmentally oriented opinions of the public were identified through the public consultation program. They are listed in the following sections together with B.C. Hydro's response, in so far as it is relevant to analysis of the route network, design of the project, and preparation of an environmental management plan for the project.

(a) **Electric and Magnetic Field (EMF) Effects**

There is concern over the perceived risk to human and animal health from EMF effects caused by high voltage transmission lines.

In the study area, this is enhanced by the number of lines and the increased voltage of 5L46 where it replaces 2L1.

Questions were asked as to what allowance B.C. Hydro made for these effects when selecting routes near homes.

B.C. Hydro Response:

* The consensus of the World Health Association, the New York State Power Lines Project, and Health and Welfare Canada, after evaluating all of the available data, is that no risk to human health resulting from exposure to EMF from electrical transmission lines has been established.

Within British Columbia this conclusion is supported by the B.C. Utilities Commission inquiry in July 1989 regarding the possible relocation of a 230kV line due to EMF. That inquiry concluded, in part, "There is, however, insufficient evidence to support a presumption of an actual health risk. This conclusion holds for....residences close to high voltage transmission lines." B.C. Hydro is following this conclusion in location of the new project.

* B.C. Hydro recognizes the concerns that some scientific and media reports have generated. B.C. Hydro is supporting research efforts related to exposure evaluation, mitigation and a better understanding of possible health effects. It is monitoring new data and studies throughout the world to ensure that it is abreast of any new discoveries.

* In addition B.C. Hydro had field strengths measured at nine locations where the current transmission lines passed near inhabited areas. Values were then computed for the fields that would exist after the new 500kV circuit was constructed. Through the utilization of new tower designs, the future fields have been substantially reduced over older types of tower design and, in regard to magnetic fields, are not substantially higher than fields that exist under average loadings on the present 230kV line. An analysis of residence distance from the new transmission line route was undertaken and it revealed a relatively small number (41) of close residences (within 150m). The route changes that have been recommended have substantially lowered the number of close residences, and further proposed route changes will reduce this number even more.

(b) **Visual Impacts**

Opinion was expressed that transmission lines had adverse visual impact and assurances were sought that B.C. Hydro had taken visual impacts into account in project routing.

B.C. Hydro Response:

* Visual analysis of the proposed routes has been undertaken as one component of environmental studies for the project.

* Environmental studies have confirmed that location within the existing corridor would have the least overall visual impact, coupled with removal of 2L1.

* B.C. Hydro proposes to use the opportunity of replacement of 2L1 with 5L46 to reduce present adverse visual impact in certain locations, including Seton Portage, D'Arcy, Gates River valley, Pemberton, and Whistler.

* B.C. Hydro acknowledges that in some areas extra clearing may be required along the existing 2L1 ROW to accommodate a 500kV line.

(c) **Vegetation Management**

There is widespread concern over use of herbicides for ROW maintenance. Many people expressed preference for manual or mechanical control of vegetation, or best, for biological control.

B.C. Hydro's Response:

* Regular inspection and maintenance of transmission lines is crucial to public safety and reliable service.

* Tall, fast-growing species (e.g. alders, cottonwood) must be controlled along rights-of-way.

* B.C. Hydro uses three vegetation management techniques: biological (introduction of competing plants); physical (manual or mechanical cutting); and chemical (species or site-specific herbicide application).

* Biological control (promotion of low growing native vegetation or cultivated vegetation) is the preferred method.

* Herbicides may be required in certain site or species-specific situations and are applied by injection or cut surface treatments. Aerial herbicide spraying is not practised by B.C. Hydro.

* Herbicides are applied only under the supervision of certified applicators and never during the picking season for edible berries.

* B.C. Hydro does not apply herbicides on private land without agreement of the owner.

* B.C. Hydro vegetation management strategy aims to eliminate dependence on herbicides.

(d) **Meager Creek, Independent Power Producers (IPP)**

Questions were asked as to whether the proposed generation development at Meager Creek, or other IPPs in the region, were factors in location of this report.

B.C. Hydro Response:

* POWEREX, the B.C. Hydro subsidiary responsible for negotiation with developers of IPPs for export purposes, rejected a proposal for the development of Meager Creek, therefore a electrical transmission from Meager Creek is not an immediate issue for this project.

* B.C. Hydro has agreed to purchase power from a company wishing to develop a small hydro plant on the Soo River. If this proceeds, transmission from the plant would probably be on a single woodpole line to Rainbow substation in Whistler, and would not affect this project.

* No other IPPs are presently proposed that might require connection to this project.

(e) **PCB Storage**

Dissatisfaction was expressed in Birken and Pemberton with the continued storage of PCBs by B.C. Hydro at Creekside Capacitor Station.

Questions were asked as to the type and location of capacitors to be used for the project.

B.C. Hydro's Response:

* It is recognized that a capacitor station on 5L46 may be necessary in the future, located near the mid point of the project. It is proposed that this station would be located in an expansion at the existing capacitor station at Creekside. No capacitors using PCBs would be used as the material is banned and no longer manufactured.

* Storage of PCBs at Creekside meets regulatory requirement, and will be terminated when destruction facilities become available.

(f) **Support for Use of Existing Corridor**

The great majority of opinion expressed favoured use of the existing corridor for 5L46, particularly if a more sensitive alignment than that of 2L1 could be found.

B.C. Hydro Response:

* B.C. Hydro recognizes the technical and environmental benefits of using the existing corridor. Apart from the Mission Ridge section, it uses valleys and is therefore more easily constructed, inspected and maintained, as good road access is readily available.

* It is recognized that the alignment of 2L1 often conflicts with the pattern of development that has evolved along it since its construction in 1948. B.C. Hydro proposes to locate 5L46 off the 2L1 ROW where the location of the 2L1 ROW is inconsistent with present and intended land use, to the extent that is practical.

(g) **Pavilion Route Favoured Over Antoine Route**

There has been support for use of Pavilion route rather than the Antoine route from other than the native community, the position of the local native community is not known.

B.C. Hydro's Response:

* B.C. Hydro recognizes the need to determine if the project can be routed through Pavilion IR1 and Bridge River IR1. Discussions have started with the Lillooet Tribal Council and the Bands to ascertain if agreement can be reached on the terms and conditions for such ROWs.

* The position of the residents of the Yalakom Valley is recognized and understood.

* In case an agreement cannot be reached with the Bands, B.C. Hydro reviewed alternate routes in 1990 (Ore & Bridge), and concluded that the line could be constructed on the Bridge route with less impact than use of the Antoine route.

(h) **Anderson Route Favoured Over Duffey Route**

There was a strong majority of opinion in favour of use of the existing transmission corridor along Anderson Lake rather than use of the Duffey route.

B.C. Hydro's Response:

* This opinion is understood and reflected by the choice of the generally favoured route.

(i) **Public Interest Groups**

Outdoor Recreation Council of British Columbia

The Council advised B.C. Hydro by letter of the following:

* It prefers use of existing corridors to prevent further intrusion into backcountry and wilderness areas.

* It prefers the Pavilion/Mission option to the Antoine segment.

* It is strongly opposed to routing through provincial parks and opposes the Birkenhead route through Birkenhead Lake Park and the Owl route over the proposed Mount Ronayne Recreation Area.

* It opposes the Birkenhead/Ryan route option for the reasons previously given.

* If prefers use of the existing corridor to the Soo/Rainbow route as the Rainbow area is heavily used for backcountry recreation.

B.C. Hydro Response:

* The positions are recognized and incorporated into the route analysis.

Federation of Mountain Clubs of British Columbia

The Federation advised B.C. Hydro of the following:

* It prefers use of existing corridors.

* It opposes routes through Birkenhead Lake Provincial Park and proposed Mount Ronayne Recreation Area. It strongly prefers that the route through Whistler be used rather than one through Rainbow Pass.

B.C. Hydro Response:

* The positions are recognized and incorporated into the route analysis.

British Columbia Wildlife Federation

The Federation advised B.C. Hydro that:

* It prefers use of existing corridors.

B.C. Hydro Response:

* The position is recognized and incorporated into the route analysis.

The Federation of British Columbia Naturalists

The Federation advised B.C. Hydro that:

* There is concern about people moving into an area traversed by transmission lines and then arguing that the lines should be moved to an area still in its natural state to improve their views.

* There were specific concerns regarding the following segments:

  - Antoine - very rugged, no roads, sheep habitat.
  - Duffey - natural setting for road should be retained.
  - Birkenhead - no road through park, good natural environment.
  - Owl - subalpine should not be disturbed.
  - Ryan and Soo - good grizzly bear habitat.
  - Rainbow - good natural environment.

* Its members would oppose routing through any of the above segments and believed that tourism at Whistler should be controlled.

* That B.C. Hydro should support conservation by disturbing only where and when necessary.

B.C. Hydro's response:

* The positions are noted and incorporated into the analysis.

Pemberton Sportsmen's Wildlife Association

The Association advised B.C. Hydro that it was most concerned with proposed routes through Birkenhead Lake Provincial Park, the Owl-Tenquille Lake area, and other wilderness areas, and that it believed that, if the line must be built, it should follow existing transmission line routes as closely as possible.

B.C. Hydro's response:

* The comments are noted and incorporated into the route analysis.

5.3 CONCLUSIONS FROM SOCIO-ECONOMIC REPORT

The land use concerns addressed by this report are discussed in Section 6. Issues related to compensation or mitigation are discussed in Section 9. The general issues emerging from the report in relation to route analysis and environmental impact potential are:

(a) **Tourism Traffic**

The completion of paving of the Duffey Lake Road will create a readily accessible tourist loop from Vancouver with many areas of interest: Howe Sound, Cheakamus Canyon, Whistler, Pemberton Valley, Duffey Lake, Cayoosh Canyon, Lillooet, Lytton, Fraser Canyon, Hope, and Fraser Valley.

The rapid expansion of Whistler has lead to a concerted effort to expand summer and shoulder season traffic.

The project could conflict with tourism in competition for accommodation in the northern part of the project area and with increased traffic on the roads of the project area.

This conflict would be reduced if the Duffey route were not used. The Duffey Lake Road has long hills and several twisty narrow sections. Construction traffic would definitely delay tourists, and vice versa.

B.C. Hydro Response:

* It is accepted that construction traffic in the summer and fall for the four year construction period would conflict with tourist traffic. It is agreed that not using the Duffey segment would reduce delays to tourist traffic caused by construction traffic on that popular road.

(b) **Tourist Accommodation**

There is plenty of accommodation for the number of construction workers necessary for the project from Pemberton south. There will be competition for accommodation in the northern part of the project, particularly in Lillooet, and Shalalth/Seton Portage if the existing corridor is used.

B.C. Hydro Response:

* If the Duffey route is used, competition for accommodation at Lillooet would be greater than if the existing corridor is used as a limited amount of accommodation is scattered from Gates Lake to Shalalth while none exists on the Duffey route.

* From its previous experiences of work in the Anderson Lake area B.C. Hydro notes that it may be desirable to establish a construction camp at Shalalth for the five year period of construction, if the existing corridor is selected. A potential site with services, which was used for the recent tunnel camp of B.C. Rail at Shalalth, exists on Slosh IR1. This would be investigated further if the project proceeds.

(c) **Release of 2L1 ROW**

It is noted that several areas would benefit from routing of 5L46 off the 2L1 ROW. It is recommended that this occur, with release of the 2L1 ROW, at:

* Shalalth/Seton Portage
* D'Arcy
* Gates and Birkenhead River valleys
* Pemberton
* Lower Cheakamus Valley
* Pinecrest and Black Tusk villages
* Whistler

B.C. Hydro Response:

* It is B.C. Hydro's intent to release the 2L1 ROW where it is surplus to B.C. Hydro's needs and can be abandoned (i.e. not required for the project or other present or future use) subject to the policy detailed in Section 7.2 of this report.

* It is recognised that at Seton Portage release of 2L1 ROW would benefit both the Seton Lake Indian Band and private land owners. Given the limited amount of developable land in the Shalalth/Seton Portage community, the unused portion of the ROW could be released subject to the agreement of the Seton Lake Band for a new ROW through the north west corner of Seton Lake IR5A adjacent to 5L42.

* Location up slope from the present 2L1 ROW near the approach to D'Arcy from the south would improve the visual aspect of the community. Such relocation would benefit the overall community, the Anderson Lake Indian Band and private land owners. B.C. Hydro agrees that the route should be adjusted, and would do so if the Anderson Lake Indian Band agrees to a new, but shorter, ROW for the project on its Nequatque Reserve adjacent to 3L2.

* It is recognized that the present location of 2L1 creates visual impacts and land use conflicts in the Gates and Birkenhead River valleys. B.C. Hydro has proposed a route in the Gates River valley which it believes reduces visual impacts and land use conflicts.

* In the Birkenhead River valley, B.C. Hydro proposes to review a possible alignment on the east side of the valley during the survey and design stage. If it offers significant reductions in impacts and conflicts along this narrow valley it would be adopted.

* It is recognized that the location of 2L1 and 2L2 through the Village of Pemberton reduces the limited area of land available for development above the flood plain. B.C. Hydro proposes to remove 2L1 from Pemberton if 5L46 is constructed. The intent is to leave 2L2 to feed the Pemberton substation.

* B.C. Hydro is not yet certain as to whether 2L1 would be removed south of Rainbow substation at Whistler. (See Section 7.2 particularly the paragraph entitled "Rainbow Substation to Cheekye").

(d) **Upgrading of 'Highline' Road**

It is proposed by the Seton Portage-Shalalth District Chamber of Commerce, the Seton Lake Indian Band, and some members of the public, that the above road be upgraded, with the Chamber wanting fast action and the Band preferring a slower timetable.

B.C. Hydro Response:

* The road would only be upgraded to the extent required for construction and then only if the existing corridor is to be used. B.C. Hydro hopes to negotiate a transfer of the road to the Lillooet District of the Ministry of Forests on completion of construction.

* This is considered desirable as forest operations have already started in McGillivray and Connel drainages and would continue to spread along Anderson Lake. There are clear cost and environmental benefits in avoiding duplication of the road.

(e) **Maintenance of ROW**

It is proposed that B.C. Hydro encourage compatible uses of the ROW such as growing of Christmas trees, berries or wild foods, and recreation, and encourage local hiring for ROW maintenance.

B.C. Hydro Response:

* B.C. Hydro usually holds its ROW as an easement over private or Crown lands. Where a private owner wishes to grow Christmas trees, or other low vegetation, on the ROW, B.C. Hydro would offer full encouragement and financial assistance, recognizing that its maintenance costs are reduced.

* Where the easement is on Crown land, the Crown still has the jurisdiction to grant a lease for Christmas tree production or a similar enterprise. If such a lease is granted, B.C. Hydro would also offer the lessor support.

* Where the ROW goes over private land B.C. Hydro has no right to encourage access for recreation. B.C. Hydro is pleased to cooperate in use of its ROW for recreation on crown land, or land owned by B.C. Hydro.

* B.C. Hydro encourages the growth of berry plants and other low vegetation on its ROWs in an effort to establish biological vegetation control.

  Where these occur, and where requested by local residents, efforts are made to keep conditions favourable for the berries and to avoid use of herbicides.

* B.C. Hydro does attempt to hire local crews for brushing on the ROWs (for example, members of the Anderson Lake Band), but where herbicides are being used, at least one person must be certified as a herbicide applicator. In some instances, certified tree trimmers are required. Such people are not always available locally. Contracts are designed to encourage bids from local contractors, recognizing that tenders must be publically advertised.

6.0 ROUTE NETWORK ANALYSIS

6.1 GENERAL

The comparison made between options in this analysis of the route network takes into account the environmental features of each option as described in Section 4, the opinions of the environmental consultants, and the opinions collected through in the public consultation program which are summarised in Sec. 5 and more fully recorded in the public consultation report[1]. The preferences of the environmental consultants and the results of the public consultation program are summarized in Tables 6.1a, 6.1b, 6.2, and 6.3.

B.C. Hydro has prepared a separate technical report[2] in which each segment of the network is reviewed in terms of technical problems for construction, operation, maintenance, and cost. This section should be read in conjunction with that technical report.

The route network shown on Figure 2 is analyzed by a process of successive reduction, rejecting the option that is least attractive to the public and the environmental consultants in each comparison. The comparisons are presented in order from north to south.

6.2 FRASER CROSSING (CE VERSUS CDE)

The northern route (CE) lies adjacent to 5L42 for its full length. The southern sub-option (CDE) lies adjacent to 5L41 from C to D (2 km) and is then on its own to E (4 km).

In this very dry area it is difficult to restore disturbed ground as revegetation is slow. To reduce visual impacts it is therefore better to reduce disturbance of the ground. On CE, access roads exist along 5L42 which can be used to construct 5L46. On CDE, new access roads would be required to tower locations on either side of the Fraser River crossing.

Bighorn sheep use the steep banks and benchlands above the Fraser as winter range. wildlife managers prefer use of CE as they do not want to see further road access developed in the sheep range.

Use of CE requires crossing ALR lands within Pavilion IR, which are presently used as range. The route skirts ALR land on the west side of the Fraser River. CDE crosses a narrow block of ALR land on the east side of the Fraser, but avoids land that is presently cultivated. On the west side it crosses a large block of ALR land which is presently used as pasture. The owner of the farm lands on the east side prefers CE.

CE requires a further ROW from the Pavilion IR while CDE crosses the Pavilion IR on an existing ROW.

CDE creates several adverse visual impacts. It requires two crossings of Highway 12 and traverses the bare flats on the east side of the Fraser in full view from the highway. On the east side of the highway the crossing of 5L41, 2L90, and 2L91 would be very exposed, because there are no screening trees, and would be highly visible as tall towers would be necessary. On the west side of

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1 Synergistics Consulting Limited, Kelly Lake to Cheekye Substation Second 500kV Transmission Line Public Consultation Report, Phase I and II, March 1991.

2 B.C.Hydro Transmission Engineering Division, Kelly Lake-Cheekye 500kV Transmission Line, Technical Report, March 1991.

TABLE 6-1A **ENVIRONMENTAL CONSULTANT OPINIONS ON 1989 ROUTE OPTIONS**

Consultant		Terrain	Land Use	Agriculture	Foresty & Vegetation	Fish	Wildlife	Visual & Recreation	Heritage	Consultant Consensus
1989 Studies										
CE CDE	Fraser North vs. Fraser South	1	1	1	1	2	1	1	1	1
BG BFG	Antoine vs Pavilion/Mission	2	2	1	2	2	2	2	2	2
FJ FGHJ	Duffey vs Mission/Anderson/Gates	2	2	0	2	2	2	2	2	2
BGHJ BFJ	Antoine/Anderson/Gates vs Pavilion/Duffey	2	1	1	1	1	1	1	2	1
HIK HJK	Birkenhead/Owl vs Gates/Pemberton	2	2	2	2	2	2	2	2	2
HIMN HJKLN	Birkenhead/Ryan Rainbow vs Gates/Pemberton/Green Whistler	2	2	2	2	2	2	2	2	2
LMN LN	Soo/Rainbow vs Whistler	2	2	0	2	2	2	2	2	2
PR PQR	Lower Cheakamus West vs Valley	2	1	1	2	2	1	2	2	2
RST RT	Lower Cheakmus South vs Valley	2	1	1	2	2	1	2	2	1
QS QRS	Lower Cheakmus East vs Valley	2	1	1	2	2	1	2	2	2

Legend
a) 1 indicates first option listed is preferred
b) 2 indicates second option listed is preferred
c) 0 indicates no preference

TABLE 6-1B ENVIRONMENTAL CONSULTANT OPINIONS ON ROUTE OPTIONS STUDIED IN 1990

Consultant		Terrain	Land Use	Agriculture	Foresty & Vegetation	Fish	Wildlife	Visual & Recreation	Heritage	Consultant Consensus
1990 Studies UV UXV	Ore vs. Part of Antonine	2	2	2	2	2	2	2	2	2
F1XVG vs F1FG	Bridge/Part of Antoine Part of Pavilion/Mission	2	2	2	2	2	2	2	2	2
BUX BWCEF1X	Part of Antoine vs Part of Pavilion Bridge	2	2	1	2	2	2	1	2	2
WW1DE WCE	East Pavilion vs Part of Pavilion	2	2	2	2	2	2	2	2	2
WW1F1 WCEF1	South Pavilion vs Part of Pavilion	2	2	2	2	2	2	2	2	2
Rev Orig	Seton Sub-option	2	0	0	2	2	2	2	0	2
Rev Orig	D'Arcy Sub-option	2	2	0	2	2	2	2	2	2
Rev Orig	Lokla Sub-option	2	2	0	2	2	2	2	2	2
Rev Orig	Function Sub-option	1	1	0	1	1	1	1	2	1
LMN1Y1 LY1	Soo/Part of Rainbow Callaghan vs Part of Whistler	2	2	0	2	2	2	2	2	2
N1Y2ZT N1NPSZT	Callaghan/High Cheakamus vs Part of Rainbow/Upper & Lower Cheakamus	2	1	1	2	2	1	1	1	1
YZT YNPSZT	High Cheakamus vs Part of Whistler Upper & Lower Cheakamus	2	1	1	2	2	1	1	1	1

Legend a) 1 indicates first option listed is preferred b) 2 indicates second option listed is preferred c) 0 indicates no preference

Table 6-2
PREFERENCES ESTABLISHED IN PUBLIC CONSULTATION PROGRAM

ORGANIZATION	CE FRASER NORTH VS CDE FRASER SOUTH	BG ANTOINE VS FG PAVILION/ MISSION	FJ DUFFEY VS FGHJ MISSION/ ANDERSON/ GATES	BGHJ ANTOINE/ ANDERSON/ GATES VS BFJ PAVILION/ DUFFEY	HIK BIRKENHEAD OWL VS HJK GATES/ PEMBERTON
REGIONAL DISTRICTS					
Squamish Lillooet	X	X	X	X	X
Thompson Nicola					
MUNICIPALITIES					
Clinton					
Lillooet	X	X	X	X	X
Pemberton					
Whistler					
Squamish					
INDIAN BANDS					
Mount Currie			X	X	
COMMUNITIES*					
Clinton	X	X	X	-	X
Lillooet	X	X	X	-	X
Yalakom	X	X	X	X	X
Seton/Shalalth	X	X	X	-	X
D'Arcy/Birken	-	-	X	X	X
Pemberton	X	X	-	-	X
Whistler	X	X	-	-	X
Squamish	X	X	-	-	X
LAND OWNER					
Diamond S.	X				X
Birkenhead Lake Estates					
North Vancouver School Board					
INTEREST GROUPS					
Outdoor Recreation Council	X	X	X	-	X
Federation of B.C. Naturalists		X	-	-	X
B.C. Wildlife Federation					
Federation Mountain Clubs B.C.	X	X	-	-	X
Pemberton Sportmen's Wildlife Association		X			
Public Consensus To Date	X	X	X	X	X

KEY:

1. X indicates a stated preference.
2. - indicates not enough information to establish preference.
3. Blank indicates no information.
4. Full opinion of Indian Bands is not yet included

*NOTE: These preferences are based on attendance at open houses held by B.C. Hydro. No attempt was made to survey the entire community.

the Fraser the convergence of 5L46 and 5L42 on the bare terrace would be highly visible and visually confining to local residents. CDE creates a visually separate second crossing of the Fraser River, detracting from the quality of the view from the river. By contrast CE does not create impacts in new areas and presents a small increment to the visual impact of 5L42 when viewed from Highway 12 or the Fraser River.

CE crosses Slok Creek on the west side where it is in a deep gully. CDE avoids Slok Creek. The difference is immaterial in establishing a preference. There are more recorded heritage sites on CE, but most are outside the ROW, and can be spanned, or otherwise avoided. Potential for unrecorded sites is high on CDE with sites of high significance on ROW. New access road on CDE could impact unrecorded sites. The separated crossing of the canyon by CDE increases the existing risk to light aircraft using the Fraser Canyon flight path.

Reviewing all these factors, the northern route (CE) is preferred by the environmental consultants because of its lower visual impacts, less intensive land use and wildlife impacts and lower security risk over the southern sub-option (CDE).

This preference has been established without the benefit of discussion with the Pavilion Indian Band.

6.3 ANTOINE (BG) VERSUS PAVILION/MISSION (BCEFG)

The descriptions of the important environmental features in these segments are given in Sections 4.4, 4.3, and 4.5 respectively. The route options are compared in Table 6-3.

Review of Table 6-3 indicates a strong preference for use of Pavilion/Mission based on a lower level of environmental impact and public opinion.

The significant features in favour of the Pavilion/Mission option are the very difficult terrain of the Cavanagh Creek Valley, Fraser Canyon, and Antoine Creek Valley on the Antoine route, and the severe potential impact on wildlife in the above areas and Mission Ridge. Use of the Antoine route would lose the option for wilderness designation of Antoine Creek drainage by Ministry of Forests, and have a high impact on the small community there. Use of the Pavilion/Mission route would create higher potential impacts on agriculture on the Diamond S Ranch. To some extent these are relieved by the fact that construction would occur within an existing ROW. Heritage concerns also favour use of the Pavilion/Mission route.

It must be recognized that the Pavilion/Mission route requires acquisition of a new ROW from the Pavilion and Bridge River Indian Bands. They have not yet advised B.C. Hydro of their position on route options, so B.C. Hydro has developed bypass routes for inclusion in the EPC application.

TABLE 6 - 3
ANTOINE VERSUS PAVILION/MISSION

ITEM	ANTOINE (BUXVG)		PAVILION/MISSION (BWCEFG)	
Length		44.0km		44.3km
ROW	Existing	0.0km	Existing	13.0km
	New, adjacent to 5L42	0.0km	New, adjacent to 5L42	31.3km
	New, isolated	44.0km	New, isolated	0.0km
Access Roads	New	44.0km	New	0.0km
	Existing	0.0km	Existing	44.3km
Terrain	Severe potential impacts in Cavanagh Creek valley and Fraser Canyon (7 km). High impacts would occur in Antoine Creek Valley (9 km), and on Mission Ridge (6 km).		High impacts are anticipated only on Camelsfoot Range (between E & F) (10 km).	
Land Use and Agriculture	ALR rangelands (3 km) are crossed on west side of Fraser. Commune lands (DL 3223) are crossed in Antoine Creek valley, making a severe intrusion on this isolated settlement. A small settled area is crossed at Bridge River.		On Diamond S Ranch crosses 2 km of irrigated lands, 1 km of pasture, and 4 km of range, all within ALR. On Pavilion IR, 4 km of ALR range is crossed. Requires ROW from Pavilion and Bridge River Bands.	
Forest/Vegetation	Forest impact potential is moderate, but impact on wilderness values would be high in Antoine Creek valley. Sensitive sites extend for 8 km.		Forestry impact potential is low.	
Fish	Low potential impact.		Low potential impact.	
Wildlife	New access allows intrusion into bighorn sheep range in Fraser Canyon and wildlife habitat in Antoine Creek valley, and would provide easier access to mountain goats in Bridge River Canyon. Potential impacts are severe.		Low potential impact.	
Visual & Recreation	High potential impact at Fraser River and Bridge River crossings and in Antoine Creek valley.		Low and moderate impact potential.	
Heritage	High impact possible at two major village sites and on west side of Fraser. Potential for more sites at Bridge River.		Impact possible on sites with high importance on Pavilion Mtn., at Fraser crossing, on Camelsfoot Plateau, and at Bridge River.	
Public Consultation	Strong opposition from residents of Antoine Creek, Bridge River valley, Yalakom Community Council, Squamish Lillooet Regional District, and outdoor groups.		No consultation yet with Indian Bands.	

6.4 DUFFEY (FJ) VERSUS MISSION/ANDERSON/GATES (FGHJ)

The description of the important environmental features in these segments is given in Sections 4.6, 4.5, 4.7, and 4.9 respectively. The route options are compared in Table 6-4.

Review of Table 6-4 indicates a strong preference for the use of Mission/Anderson/Gates based on a lower general level of potential impacts and public preference.

The major factors in favour of the Mission/Anderson/ Gates route are as follows:

- A strongly stated desire to retain the Duffey segment in a natural state as a tourist corridor.
- Visual impacts at Lillooet, Cayoosh River valley, Duffey Lake, Joffre Lakes Recreation Area, Mount Currie new village.
- Potential impacts on wildlife.
- Loss of productive forest land.
- Greater use of existing ROW.

It should be recognized that the Duffey route would require new ROW from the Bridge River, Lillooet, and Mount Currie Bands. Only the Mount Currie Band has given an opinion to date and they oppose the Duffey segment. The Mission/Anderson/Gates route has presently planned would require new ROW from the Bridge River, Seton Lake, and Anderson Lake Indian Band. The Anderson Lake Band has indicated it is prepared to negotiate the necessary new ROW.

The significant factors in favour of the Pavilion/Mission route as follows:

- The very difficult terrain of the Cavanagh Creek valley, Fraser Canyon, and Antoine Creek valley on the Antoine route.
- The severe potential impact on wildlife in the above areas and on Mission Ridge from use of the Antoine route.
- Loss of wilderness values in Antoine Creek valley.
- Severe visual impact for small community in Antoine Creek valley.
- Loss of productive forest land on Antoine route.
- Impact on major heritage sites on Antoine route.

6.5 ANTOINE/ANDERSON/GATES (BUXVGHJ) VERSUS PAVILION/DUFFEY (BCEFJ)

It is necessary to compare the Antoine segment, in association with the Anderson and Gates segments, to the Pavilion and Duffey segments, because even though use of either the Antoine or Duffey segments is known to have high potential impacts, the combinations shown are feasible.

The environmental information on these segments is given in Sections 4.4, 4.7, 4.9 and 4.3 and 4.6.

TABLE 6-4
DUFFEY VERSUS MISSION/ANDERSON/GATES

ITEM	DUFFEY (FJ)		MISSION/ANDERSON/GATES (FGHJ)	
Length		89.0km		82.0km
ROW	New, isolated	74.0km	New, isolated	9.5km
	New, adjacent to other lines	15.0km	New, adjacent to other lines	39.5km
	Existing	0.0km	Existing	33.0km
Access roads	Existing	89.0km	Existing	77.0km
Terrain	Impacts would be high near Lillooet, and very high in Cayoosh Canyon. Difficult areas occur all along Cayoosh Creek valley and in Joffre Creek valley. Helicopter construction would be required in Cayoosh Canyon.		The high section on Mission Ridge crosses sensitive alpine terrain with high impact potential. There is potential for high impacts in developing access roads down the steep slopes of Anderson Lake to 2L1 ROW. The route on the south side of Gates River valley crosses difficult terrain. Helicopter construction would reduce impacts.	
Land Use/ Agriculture	High impact potential on narrow irrigated field north of Lillooet, in traverse of B.C. Hydro Recreation Area at Seton Lake, and passing village in Mount Currie IR 6.		Location in Gates River valley and at D'Arcy would reduce land use conflict below that of 2L1.	
Forestry	Potential impact is moderate to high because of loss of productive sites.		Potential impact is low to moderate as sites are less productive.	
Fish	Risk of cumulative impacts in Cayoosh Creek as it is paralleled for 38 km downstream of Duffey Lake, 28 km would be machine cleared and prone to erosion.		Gates River is sensitive as it feeds a spawning channel and is used by salmon. 8 km of new ROW would parallel river, 7 km would be hand cleared.	
Wildlife	Impacts would be high as wildlife values are high.		Impacts would be low as only short sections of new ROW would be required.	
Visual & Recreation	High potential visual impacts in Fraser Canyon, at Lillooet, and in Seton River valley. Impacts would be severe in Cayoosh Canyon but moderate elsewhere, except for new Mount Currie village, where impacts would be high. The project would detract from natural quality of landscape along Duffey Lake Road.		Potential visual impacts are low as they are only a modest increment to present situation, or replacing 2L1. By relocation at D'Arcy and Gates River valley, visual impacts at these locations would be reduced.	

TABLE 6-4
DUFFEY VERSUS MISSION/ANDERSON/GATES

ITEM	DUFFEY (FJ)		MISSION/ANDERSON/GATES (FGHJ)	
Length		89.0km		82.0km
ROW	New, isolated	74.0km	New, isolated	9.5km
	New, adjacent to other lines	15.0km	New, adjacent to other lines	39.5km
	Existing	0.0km	Existing	33.0km
Access roads	Existing	89.0km	Existing	77.0km
Heritage	Sections with high potential exist in Fraser Canyon, near Lillooet, in Seton River valley, and near Mount Currie in IR 6.		High numbers of known sites exist at Seton Portage outside ROW. Additional sites are near or within ROW but impacts could be controlled.	
Social	Construction traffic would compete with tourists on Duffey Lake Road.		Domestic water systems along Anderson Lake are sensitive to disturbance.	
Public Consultation	SLRD, Village of Lillooet, Mount Currie Indian Band, all outdoor groups contacted, and most individuals expressing opinion opposed this route.		Some residents of Gates River valley stated preference for use of Duffey route.	

TABLE 6-5
ANTOINE/ANDERSON/GATES VERSUS PAVILION/DUFFEY

ITEM	ANTOINE/ANDERSON/GATES (BUXVGHJ)		PAVILION/DUFFEY (BWCEFJ)	
Length		110.0km		118.3km
ROW	New, isolated	53.8km	New, isolated	74.0km
	New, adjacent other lines	24.5km	New, adjacent other lines	31.3km
	Existing	33.0km	Existing	13.0km
Access Roads	New	53.8km	New	0.0km
	Existing	46.5km	Existing	118.3km
Terrain	Severe impact potential in Cavanagh Creek valley and Fraser Canyon. High impact potential in Antoine Creek valley and on Mission Ridge. There is potential for high impacts in developing access roads down steep slopes of Anderson Lake to 2L1 ROW. The route on south side of Gates River valley crosses difficult terrain. Helicopter construction would reduce impacts.		High impact potential on east side of Camelsfoot Range and near Lillooet. Very high impact construction would be required in canyon. Areas of difficult terrain occur along Cayoosh Creek Valley and in Joffre Creek Valley.	
Land Use/ Agriculture	Crosses ALR rangelands on west side of Fraser and small settlements in Antoine Creek and Bridge River valleys. Project would create a severe intrusion on these. Location at D'Arcy and in Gates River valley reduces land use conflicts below that of 2L1.		Crosses major ALR unit on Diamond S Ranch, 2 km of irrigated lands, 1 km of pasture, and 4 km of range. On Pavilion IR crosses 4 km of ALR rangelands. High impact potential on narrow irrigated field north of Lillooet, in traverse of B.C. Hydro Recreation Area at Seton Lake, and in passing new village in Mount Currie IR 6.	
Forestry/ Vegetation	Forestry impact potential is moderate for Antoine, and low to moderate for Anderson and Gates segments. Wilderness loss would occur in Antoine Creek Valley. Sensitive sites occur over 18 km.		Potential forestry impact is low for Pavilion and moderate to high for Duffey. No wilderness loss. Sensitive sites occur over 2 km in Fraser Canyon.	
Fish	Gates River is sensitive as it feeds a spawning channel and is used by salmon. 8 km of new ROW would parallel river, but with 7 km cleared by hand, reducing risk of siltation.		Risk of cumulative impact in Cayoosh Creek as it is paralleled for 38 km downstream of Duffey Lake.	

TABLE 6-5
ANTOINE/ANDERSON/GATES VERSUS PAVILION/DUFFEY

ITEM	ANTOINE/ANDERSON/GATES (BUXVGHJ)		PAVILION/DUFFEY (BWCEFJ)	
Length		110.0km		118.3km
ROW	New, isolated	53.8km	New, isolated	74.0km
	New, adjacent other lines	24.5km	New, adjacent other lines	31.3km
	Existing	33.0km	Existing	13.0km
Access Roads	New	53.8km	New	0.0km
	Existing	46.5km	Existing	118.3km
Wildlife	New access could permit intrusion into bighorn sheep range in Fraser Canyon, to Antoine Creek valley, and gives easier access to mountain goats in Bridge River canyon. Remainder of potential impacts are low.		Potential impacts are considered high throughout Cayoosh River valley due to its high wildlife values.	
Visual & Recreation	High impact potential at Fraser and Bridge River crossings, and in Antoine Creek valley. Potential impacts elsewhere are low, representing a modest increment to present situation. By moving off 2L1 ROW at D'Arcy and Gates River valley, visual impact at these locations would be reduced relative to present situation.		Low impact potential in Pavilion segment. Visual impacts would be high near Lillooet and in Seton River valley. Impacts would be severe in Cayoosh canyon, then moderate for remainder of Duffey segment, except high at Mount Currie new village.	
Heritage	High impact possible at two major village sites and on west side of Fraser. Elsewhere potential impact is low.		High impact possible on sites on Pavilion Plateau, at Fraser River crossing, Camelsfoot Range, near Bridge River, Lillooet, in Seton River valley and Mount Currie IR 6.	
Public Consultation	SLRD objects to intrusion into new areas such as Antoine segment, but finds this option less objectionable than Pavilion/Duffey. Antoine Creek valley residents and outdoor groups are not in favour of Antoine section of this option.		Village of Lillooet, Squamish Lillooet Regional District, Mount Currie Indian Band all oppose this route option.	

The summary of impact potential is given in Table 6-5. Review of this indicates that Antoine/Anderson/Gates is preferred to Pavilion/Duffey on environmental and public opinion grounds. However on heritage grounds Pavilion/Duffey is preferred due to potential impacts on large village sites in Kelly Creek valley.

The preference of the public and environmental consultants for Antoine/Anderson/Gates is based on the following major points:

- A strongly stated public desire to retain the Duffey segment in a natural state as a tourist corridor.
- The high visual impact potential of use of the Duffey corridor over a long length.
- The greater impacts of use of the Duffey route on wildlife.
- The greater use of existing ROW by the Antoine/Anderson/Gates route.
- The greater impact of use of the Duffey segment on forestry and on land use near settlements.
- The greater impact of the Pavilion segment on agriculture in the Diamond S Ranch.
- Less community impact potential for the Antoine/Anderson/Gates route option.

This conclusion should then be modified for in Section 6.3 it was established that the Pavilion/Mission route was strongly preferred to Antoine. Thus the preference for Antoine/Anderson/ Gates relative to Pavilion/Duffey confirms the conclusion of Section 6.3.

6.6 BIRKENHEAD/OWL (HIK) VERSUS GATES/PEMBERTON (HJK)

The description of the important environmental features in these segments is given in Sections 4.8, 4.10, 4.9 and 4.12 respectively. The route options are compared in Table 6-6.

A strong preference emerges for Gates/Pemberton because of the impacts that would occur in Birkenhead Lake Provincial Park, Owl/Fowl uplands, and in the Pemberton Valley from use of the Birkenhead/Owl option. The latter is also 20% shorter and uses more of the 2L1 ROW. The Ministry of Parks is strongly opposed to location through Birkenhead Lake Provincial Park and the proposed Mount Ronayne Recreation Area.

6.7 BIRKENHEAD/RYAN/RAINBOW (HIMN) VERSUS GATES/PEMBERTON/ GREEN/WHISTLER (HJKLN)

The description of the important environmental features in these segments is given in Sections 4.8, 4.11, 4.16 and 4.9, 4.12, 4.13, and 4.15 respectively. The route options are compared in Table 6-7.

A strong preference emerged for Gates/Pemberton/ Green/Whistler as Birkenhead/Ryan/Rainbow represented the maximum possible intrusion into the back country of all route options studied. The potential impacts on Birkenhead Lake Provincial Park, the proposed Mount Ronayne Recreation Area on the Owl/Tenquille ridge, and on the alpine areas of Ryan River valley and Rutherford Creek valley, and Rainbow Pass were considered very high in comparison to those in the existing corridor.

TABLE 6-6
BIRKENHEAD/OWL VERSUS GATES/PEMBERTON

ITEM	BIRKENHEAD/OWL (HIK)		GATES/PEMBERTON (HJK)	
Length		45.0km		37.5km
ROW	New, isolated	45.0km	New, isolated	9.0km
	New, adjacent other lines	0.0km	New, adjacent other lines	11.5km
	Existing	0.0km	Existing	17.0km
Access Roads	Existing	22.0km	Existing	37.5km
	New	23.0km	New	0.0km
Terrain	The terrain on the steep ascent of the Birkenhead River valley consists of bedrock with deep deposits of gravelly sandy colluvium on lower slopes. The impact on construction could be high. The terrain in the 12 km across the subalpine portions of the Owl/Fowl uplands has many units prone to erosion. Impacts could be high.		The route on the south side of Gates River valley crosses difficult terrain for 6 km. Helicopter construction would reduce impacts. The remainder of the route is in a valley with low impacts forecast.	
Land Use and Agriculture	The route traverses the east side of Birkenhead Lake Provincial Park, prized for its natural setting and the proposed Mount Ronayne Recreation Area on the Owl/Fowl uplands. The route across the Pemberton Valley traverses farmland and an area of rural settlement. On the sidehill above Pemberton, it would cross the watershed for the village, with risk of siltation during clearing and maintenance of the ROW.		There is very little developable land in Gates River valley, locating 5L46 off the valley floor would make more land available. The Village of Pemberton is very restricted by the limited area of developable land above the flood plain. To increase the area it is proposed to locate 5L46 off the 2L1 ROW to the east of the village. This involves crossing 2 km of high capability farmland close to some homes.	
Forestry & Vegetation	Potential impact on forestry would be moderate, but with high loss of wilderness values in Owl/Fowl uplands. The impacts on vegetation in Birkenhead Lake Park would be high, and erosion in subalpine areas would cause high impact.		Impact on forestry would be low to moderate due to extensive use of existing ROW.	

TABLE 6-6
BIRKENHEAD/OWL VERSUS GATES/PEMBERTON

ITEM	BIRKENHEAD/OWL (HIK)		GATES/PEMBERTON (HJK)	
Length		45.0km		37.5km
ROW	New, isolated	45.0km	New, isolated	9.0km
	New, adjacent other lines	0.0km	New, adjacent other lines	11.5km
	Existing	0.0km	Existing	17.0km
Access Roads	Existing	22.0km	Existing	37.5km
	New	23.0km	New	0.0km
Fish	Low impact potential.		Gates River is sensitive as it feeds a spawning channel and is used by salmon. 8 km of new ROW would parallel the river. Use of hand clearing would reduce risk of siltation risk.	
Wildlife	There would be a moderate impact resulting from new access road across Owl/Fowl uplands.		Low impact potential due to use of existing ROW.	
Visual & Recreation	Moderate impacts in Blackwater River valley, high impacts in park approach, and severe impacts in Birkenhead lake Provincial Park are forecast. Severe impacts would occur in Owl/Fowl uplands, the proposed Mt. Ronayne Recreation area, and high impacts at crossing of Pemberton Valley and Nairn Falls Provincial Park.		Visual impacts between D'Arcy and Pemberton Pass could be high, but owuld be reduced from present levels.	
Heritage	Limited potential impact.		Some sites are known, none of significance within ROW.	
Public Consultation	There was no public support identified for use of this option.		Residence of Gates River valley opposed use of existing corridor because of proximity of 2L1 ROW to many homes. Location of 5L46 away from homes has been accepted by most as an improvement.	

TABLE 6 - 7
BIRKENHEAD/RYAN/RAINBOW VERSUS GATES/PEMBERTON/GREEN/WHISTLER

ITEM	BIRKENHEAD/RYAN/RAINBOW (HIMN)		GATES/PEMBERTON/GREEN/ WHISTLER (HJKLN)	
Length		100.0km		76.5km
ROW	New, isolated	100.0Km	New, isolated	25.0km
	New, adjacent to other lines	0.0km	New, adjacent to lines	20.3km
Access Roads	New, isolated	0.0km	Existing	31.2km
	New	50.0km	New	0.0km
	Existing	50.0km	Existing	76.5km
Terrain	The terrain conditions in upper Tenas Creek valley, the Ryan River valley and its tributary leading to Rutherford Creek are very difficult with many hazards and high potential impact. The traverse of the ridge between Rutherford Creek and the Soo River and the Rainbow Pass would also have high impacts. There are avalanche and slide hazards in the pass.		The only difficult terrain is the 6 km section on the south side of Gates River Valley and the wetlands in Whistler, where potential impacts are moderate.	
Land Use and Agriculture	The route passes close to the recreation subdivision at the Birkenhead Lake. The Tenas Creek valley is within a proposed recreation area. In the Pemberton Valley it crosses 2 km of high capability irrigated farmland. The remainder of the route is through forested or subalpine areas.		The route crosses pockets of developable land at D'Arcy and in the Birkenhead River valley, but avoids these in the Gates River valley. At Pemberton, a new ROW adjacent to 5L42 would be required for 2 km across high capability farmlands with potential for irrigation. Through Whistler the route is on an existing ROW or on land not planned for development.	
Forestry and Vegetation	Potential forestry impacts are rated moderate to high due to loss of productive sites and loss of wilderness values in Ryan and Rutherford Creek valleys.		Potential forestry impacts are rated low to moderate due to extensive use of 2L1 ROW.	
Fish	Low to moderate impact potential, because major streams affected are not of prime importance and ROW restoration metods would reduce impacts.		The Gates, Birkenhead and Green Rivers are important for salmon and as they are paralleled there is potential for cumulative impacts.	

TABLE 6 - 7
BIRKENHEAD/RYAN/RAINBOW VERSUS GATES/PEMBERTON/GREEN/WHISTLER

ITEM	BIRKENHEAD/RYAN/RAINBOW (HIMN)	GATES/PEMBERTON/GREEN/ WHISTLER (HJKLN)
		Use of stable 2L1 ROW and hand clearing of new ROW in Gates River valley would reduce impact rating to low.
Wildlife	The penetration of Birkenhead Lake Park, Tenas Creek, Ryan River, and Rutherford Creek valleys with new access is considered very damaging to mountain goat and grizzly bear populations of these areas with high potential impacts. Impacts in the Rainbow segment would be moderate.	As the route lies in the existing valley adjacent to highway, railway and settlement, impacts would be low.
Visual & Recreation	Severe potential impact on Birkenhead Lake Provincial Park and the proposed Mount Ronayne Recreation Area.	Visual impact could be high for 6 km section in the Green River valley.
	High visual impacts are anticipated at crossing of Pemberton Valley, alpine area at Ryan/Rutherford divide, and at Rainbow Pass. Elsewhere impacts would be moderate.	Elsewhere potential impacts are low until the approach to Whistler. Near node L one section (2 km) of ROW would have high impact as it is exposed to the highway. Potential impacts are then assessed as low to Alta Lake.
	Rutherford Creek, Soo and Callaghan River valleys are important access routes in winter and summer to recreation opportunities further west.	Near Alta Lake 3.5 km would have moderate impact, until the short section at Nita Lake which has a high rating. From there to Daisy Lake impact potential is assessed as moderate.
Heritage	The route lies over ground with limited potential except at major valley crossings. In Pemberton valley agriculture has disturbed much of the ground.	The valley route has greater potential but no significant sites are recorded within ROW.
Public Consultation	There was no public support identified for this option. Opposition was virtually unanimous.	Residents of Gates River valley opposed use of existing corridor because or proximity of 2L1 ROW to many homes. Location of 5L46 away from homes has been accepted by many as an improvement.

TABLE 6 - 7
BIRKENHEAD/RYAN/RAINBOW VERSUS GATES/PEMBERTON/GREEN/WHISTLER

ITEM	BIRKENHEAD/RYAN/RAINBOW (HIMN)	GATES/PEMBERTON/GREEN/ WHISTLER (HJKLN)
		The route east of Pemberton affects some people. Use of the existing 2L1 ROW from Green Lake to Alta Lake would avoid effects on local residents at Whistler. Use of a new route west of Alta Lake would reduce impacts for residents near Alpha Lake.

TABLE 6 - 8
SOO/RAINBOW VERSUS WHISTLER

ITEM	SOO/RAINBOW (LMN)		WHISTLER (LN)	
Length		41.0km		37.0km
ROW	New, isolated	41.0Km	New, isolated	14.0km
	New, adjacent to other lines	0.0km	New, adjacent to other lines	8.8km
Access Roads	New, isolated	0.0km	Existing	14.2km
	New	12.0km	New	2.0km
	Existing	29.0km	Existing	35.0km
Terrain	Ascent west of Highway 99 (2 km) has difficult terrain. No impact on Soo River wetlands is anticipated. Rainbow Pass is a high elevation narrow valley with terrain hazards and a high potential for adverse impacts.		The route is in the valley on stable terrain, apart from toe of Green River slide (1 km) and Alta Lake wetlands (2 km). Both can be crossed using proven techniques with low residual impacts.	
Land Use and Agriculture	The Ministry of Crown Lands has called for porposals for development of Callaghan Valley. The route traverses (2 km) the eastern fringe of land identified as suitable for nordic skiing/residential and traverses (7.5 km) land identified as suitable for golf/residential. The presence of 5L46 would impair development.		The route traverses the RMOW on an existing ROW, or modifications of such ROW, to reduce visual impact. It does not conflict with present land use planning, although it crosses land with high development potential west of Alta Lake.	
Forestry & Vegetation	The potential impacts are high due to loss of productive sites. The forest south of Rainbow Pass is one of the few remaining sizeable sections of old growth forest west of Whistler.		Impact potential is moderate to low as extensive use is made of 2L1 ROW.	
Fish	Low impact potential.		Low impact potential.	
Wildlife	Impact would be moderate due to disturbance of deer range at south end.		Impacts would be low as construction in wetlands would occur in the dormant period.	
Visual and Recreation	High visual impact would occur at crossing of Highway 99 in Green River valley and through Rainbow Pass. Moderate impact is anticipated in the Soo River valley because of probable future recreation use. Low impact is anticipated in Callaghan Creek valley except at crossings of roads and trails where high impact would occur.		South of node L, 2.5 km would have moderate impact due to exposure to highway. West of Alta Lake 3.5 km would have high impact. The crossing of Brandywine Provincial Park, Daisy Lake, and Highway 99 would have moderate impact. The remainder would have low impact. Impact on recreation would be low.	

TABLE 6 - 8
SOO/RAINBOW VERSUS WHISTLER

ITEM	SOO/RAINBOW (LMN)		WHISTLER (LN)	
Length		41.0km		37.0km
ROW	New, isolated	41.0Km	New, isolated	14.0km
	New, adjacent to other lines	0.0km	New, adjacent to other lines	8.8km
Access Roads	New, isolated	0.0km	Existing	14.2km
	New	12.0km	New	2.0km
	Existing	29.0km	Existing	35.0km
	If lower Callaghan valley is developed for golf & residences visual impacts would be high.			
	If 2L1 is removed there would be a modest reduction in visual impact through Whistler, but a greater reduction on south approach, and in Brandywine Falls Provincial Park.		Use of this option would result in removal of 2L1 along Highway 99 south of Whistler for a moderate reduction in visual impact, and a high positive impact in Brandywine Falls Provincial Park.	
Heritage	Route has low impact potential.		The valley has greater potential, but only one site has been recorded within ROW.	
Public Consultation	There are no residents presently along route. This would change if residential complex in lower Callaghan valley proceeds.		No majority opinion has been identified among Whistler residents. Some favour use of Soo/Rainbow, others prefer protection at natural areas.	
			Ministry of Crown Lands, SLRD and outdoor groups favour use of existing corridor.	

6.8 SOO/RAINBOW (LMN) VERSUS WHISTLER (LN)

The description of the important environmental features in these segments is given in Sections 4.14, 4.16, and 4.15. The route options are compared in Table 6-8.

The SLRD and all outdoor organizations consulted favoured use of the existing corridor through Whistler. However, the RMOW Council has proposed that the route through Whistler only be used subject to conditions which are under discussion with B.C. Hydro. The Advisory Parks and Recreation Commission has considered the route options and has recommended to the Council that if the line is to be routed through Whistler then "it should be consolidated with the existing corridor in such a manner as to impose the least visual impact on the valley". B.C. Hydro believes the proposed route through Whistler meets that objective.

If the Soo/Rainbow route is used it is obvious that there would be a reduction in visual impacts through Whistler if 2L1 were removed. However the benefits are not as great as might first be assumed, for from Green Lake to the west side of Alta Lake 2L1 is the centre of 3 lines in the corridor, at Alta Lake it is the least visible of the 3 lines, and has the least adverse effect of the 3 lines on the properties near Alpha Lake. If the Soo/Rainbow route is used and the High Cheakamus route selected, then it is probable that 2L1 would not be removed between Rainbow substation in Whistler and Cheekye.

Use of the Soo/Rainbow option would result in a traverse of a natural area with high potential for recreation use and important as part of the increasing recreation land base on which Whistler will depend for growth. Until now the main emphasis at Whistler has been expansion of the downhill skiing opportunities on Whistler and Blackcomb mountains, and development of recreation opportunities close to the village. The time is coming when the spectrum of recreation opportunities offered will have to increase to satisfy the needs of a more varied clientele. This western area will feature in their provision.

Garibaldi Provincial Park limits the degree and type of recreation activity that can occur east of Whistler. The recent study for the Ministry of Crown Lands of the potential for commercial recreation opportunities in the Whistler-Pemberton area has identified several other areas of high potential. Of these the most important is the area of alpine terrain stretching from Powder Mountain in the south to the Pemberton Icecap in the north, and east to include Rainbow Mountain. This area is seen as having high potential for snowmobiling, heliskiing, cross country skiing, helihiking and mountain travel in summer. Rainbow Mountain is identified as an attractive area for mountain biking.

Rutherford and Callaghan Creek valleys are the preferred entry routes for snowmobiles to this area, as the Soo River valley has no easy exit routes to the mountains to the west. The Soo River valley therefore becomes an attractive area for non-mechanized winter sport, such as cross country skiing. Given these resource capabilities, it is clear that their enjoyment would be reduced by a transmission line using the Soo and Rainbow segments, degrading the natural environment which is highly important to the image of Whistler.

In summary, if the Soo/Rainbow route is used there would be a reduction in the natural quality of the Soo and Callaghan valleys, both areas of future importance to Whistler, and in the development potential of the Callaghan valley, in return for a major visual improvement in Whistler north of Rainbow substation, as 2L1 would probably remain south of Rainbow.

If the Whistler route is used, there would be no conflict with any existing development, visual impacts within RMOW would be reduced by route improvements from Green Lake to Brandywine and there would be a major visual improvement to the southern approach to Whistler by removal of 2L1 between the Cheakamus Canyon and Whistler, and to land use in Brandywine Falls Provincial Park.

In environmental terms, use of the Whistler option is thought by the environmental consultants to have lower impact potential than use of the Soo/Rainbow option.

6.9 LOWER CHEAKAMUS SUB-OPTIONS (PR VS. PQR; QS VS. QRS; RT VS. RST)

The environmental characteristics of this section are described in Section 4.18 and the options are compared in Tables 6-9A, 6-9B, and 6-9C.

B.C. Hydro reviewed options other than the 2L1 ROW through this segment at the request of residents of the Lower Cheakamus valley. Settlement in this segment occurs in three areas, there is a scattering of rural homes between node Q and the northern boundary of the District Municipality of Squamish. The residents depend on use of B.C. Hydro's service road on the 2L1 ROW for access to their homes. B.C. Hydro owns this section of ROW in fee. To obtain legal access to those properties either the existing service road would have to be accepted by the Ministry of Transportation & Highways as a provincial road, or a new road would have to be constructed off the ROW. B.C. Hydro is reluctant to have the service road dedicated as a public road while use of the ROW is still required, as there would then be severe limits on the use of the ROW for its original purpose, access for line maintenance, and in many sections a hazard is created by having traffic, including eventually logging trucks, running close to any guys for towers. The Ministry of Crown Lands has recently acquired 20 m easements on the east side of the 2L1 ROW from the leaseholders for provision of a legal road, as the river prohibits construction of a road on the existing easement on the west side of the ROW.

A second group of homes is located along Midnight Way in DLs 1246, 1247, and 1248. They also are dependent on B.C. Hydro's service road for access, although the Municipality provides some maintenance and snow clearing for the road within its boundary.

The third area of development is in DL1244 where the North Vancouver School Board has developed their outdoor school. The road is designated a public road south of the bridge across the Cheakamus River.

The lack of a legal access road in the lower Cheakamus valley is a continuing problem for the land owners, residents, B.C. Hydro, and the Municipality of Squamish.

B.C. Hydro has reviewed the options. From the information gathered there seems little merit, environmentally, in abandoning the managed ROW on the valley floor which is well screened from most local residents, in favour of creating a new ROW on either the steep west or east side of the valley where it would be highly exposed both to local residents and travellers on Highway 99, and present considerable risk of erosion in this high rainfall area.

The situation at the south end is different. There the 2L1 ROW is located between the North Vancouver Outdoor School and the road. To replace 2L1 with 5L46 would leave the new line very close to the buildings, to move it closer to the road would result in removal of most of the remaining screen of trees along the road, and to move to the west side of the road would require clearing of mature trees used for outdoor studies.

B.C. Hydro concludes that in this section it is preferable to leave the 2L1 ROW and use a new ROW on the east side of the valley, and would consult with the Squamish Band to determine a route that would not impair the 'Wountie' site.

TABLE 6-9A
LOWER CHEAKAMUS, WEST VERSUS VALLEY

ITEM	WEST (PR)		VALLEY (PQR)	
Length		10.0km		9.1km
ROW	New, isolated	10.0km	New, isolated	2.1km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	0.0km
Access	Existing	0.0km	Existing	7.0km
Roads	New	10.0km	New	2.1km
	Existing	0.0km	Existing	7.0km
Terrain	Steep rocky terrain with coarse morainal and colluvial veneer. Potential impact high if access roads are constructed.		Descent of rocky ridge (2 km) then mature ROW on gravelly flood plain. Low impact potential.	
Land Use & Agriculture	Forest lands.		Sparse rural settlement, no homes close to line. Agriculture limited to forage production in small areas.	
Forestry & Vegetation	Moderate potential impacts. If present 2L1 ROW vegetation not maintained, trees would grow in and reduce habitat value for songbirds and deer.		Low impact potential.	
Fish	Potential for high impact because of erosion from new ROW.		Low impact potential.	
Wildlife	Generally low impact potential as it uses a low capability area.		ROW provides good browse for deer and habitat variety. Extra clearing may reduce perches for eagles.	
Visual	Highly exposed to travellers on Highway 99 and to residents of Cheakamus Valley. Impact potential rated severe as line would intrude into view of Tantalus Range from highway.		Route may be exposed to view from Highway viewpoint for 0.5 km on descent to valley floor. This section would have severe visual impact; the remainder would have low impact.	
Heritage	Limited potential except at crossing of Cheakamus River.		Some potential, but no recorded sites within ROW.	
Public Consultation	If this option were used, B.C. Hydro service road along 2L1 could be designated a public road and local owners achieve legal road access and subdivision rights.		Use of 2L1 ROW for 5L46 probably conflicts with local desire to ahcieve a recognized access road. Local residents object to use of 2L1 ROW by 5L46.	

TABLE 6-9B
LOWER CHEAKAMUS, SOUTH VERSUS VALLEY

ITEM	SOUTH (RST)		VALLEY (RT)	
Length		6.1km		4.6km
ROW	New, isolated	4.3km	New, isolated	0.0km
	New, adjascent to other lines	1.8km	New, adjacent to other lines	0.0km
Access	Existing	0.0km	Existing	4.6km
Roads	New	3.0km	New	0.0km
	Existing	3.1km	Existing	4.6km
Terrain	Steep rocky terrain with coarse morainal and colluvial veneer. High potential impacts if access roads constructed. Hazard of Cheekye Creek mud flows can be avoided.		Gravelly flood plain. Low impact potential.	
Land Use & Agriculture	Avoids settled area and Cheakamus IR by route over bluffs on east side of valley. Crosses private forest lot in DL 1817. Northern part might be within Brohm Lake Park proposal.		North Vancouver Outdoor School and Cheakamus IR are land owners. Present ROW reduces opportunities for both.	
Forestry & Vegetation	Low impact potential due to poor site capability.		Moderate impact potential as high site capability.	
Fish	High potential for erosion from ROW if much disturbance. Hand clearing proposed in most sections.		Low impact potential.	
Wildlife	Low impact potential, but ROW could require clearing of an area of mature cottonwoods, possibly used by eagles.		Low impact potential.	
Visual	Moderate impact potential on ascent of bluff. Low impact elsewhere as line would be screened from Brohm Lake and its recreation site.		High potential impact at Outdoor School, low elsewhere.	
Heritage	An important mythological site (Wountie) has been identified as one of several rock faces near bluffs crossed between R and S. It would be very undesirable to compromise quality of this site, but node S can be moved to avoid impairing site.		No recorded sites along ROW, some potential exists.	
Public Consultation	North Vancouver School Board and Squamish Band prefer this option.		Service road would be retained by B.C. Hydro.	
	Use of this route would not permit designation of B.C. Hydro service road as public road.			

TABLE 6-9C
LOWER CHEAKAMUS, EAST VERSUS VALLEY

ITEM	EAST (QS)		VALLEY (QRS)	
Length		10.0km		9.7km
ROW	New, isolated	10.0km	New, isolated	2.7km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	0.0km
Access	Existing	0.0km	Existing	7.0km
Roads	New	8.0km	New	2.5km
	Existing	2.0km	Existing	7.0km
Terrain	Steep rocky terrain with coarse morainal and colluvial veneer. High impact potential if access roads are constructed.		Gravelly flood plain rising onto rocky bluff. Low impact potential.	
Land Use & Agriculture	All forested, southern part likely to be within Brohm Lake park proposal.		Scattered rural settlement, mostly at some distance from ROW. Some small pastures.	
Forestry & Vegetation	Low impact potential due to poor site quality.		Moderate impact potential.	
Fish	High potential impact from erosion reaching Cheakamus River.		Low impact potential.	
Wildlife	Low impact potential as clsoe to highway on low capability sites.		Low impact potential as present ROW is used. Loss of mature cottonwoods near node R is acceptable.	
Visual	Severe impact potential as line would be exposed close to Highway 99 and affecting view west to Tantalus Range, and also visible to residents of valley. Line would intrude into proposed Brohm Lake park.		Low impact potential, except at ascent on bluffs where impact would be moderate.	
Heritage	Route is closest to mythological site but is above it. Some potential for sites at river crossing.		No recorded sites within ROW, some potential exists.	
Public Consultation	Use of this route would free B.C. Hydro service road for designation as public road.		B.C. Hydro service road would be retained.	

A proposal was made by B.C. Hydro to residents of the Cheakamus valley to also study a new route above 5L42 on the east side of the Cheakamus River valley, known as the "High Cheakamus segment" (YZT). This was endorsed by local residents and its characteristics are discussed in Sections 6.18 and 6.19.

6.10 ORE (UV) VERSUS PART OF ANTOINE (UXV)

The descriptions of the important environmental factors in these options are given in Sections 4.19 and 4.4 respectively. The route options are compared in Table 6-10.

The conclusion of the environmental consultants is that use of the Ore segment would have higher impacts than use of the comparable portion of the Antoine segment due to the extra length of 13 km, and its traverse of the settled area near Moha. Both would have a higher level of impact than use of the existing corridor.

The Yalakom Community Council is adamantly opposed to use of either route.

6.11 BRIDGE/PART OF ANTOINE (F1XVG) VERSUS PART OF PAVILION/MISSION (F1FG)

The description of the important environmental features in these options is given in Sections 4.20 and 4.3 and 4.5 respectively. The options are compared in Table 6-11.

The conclusion of the environmental consultants is that use of the existing corridor would have much lower impacts than use of a route along the Bridge segment. This is supported by the Yalakom Community Council.

6.12 EAST PAVILION (WW1DE) VERSUS PART OF PAVILION (WCE)

The descriptions of the important environmental features in these options are given in Sections 4.21 and 4.3 respectively. The options are compared in Table 6-12.

The conclusion of the environmental consultants is that the East Pavilion segment could be used because the potential impacts are within acceptable limits, but that use of the existing corridor, the Pavilion segment, would have lower impacts.

6.13 SOUTH PAVILION (WW1F1) VERSUS PART OF PAVILION (WCEF1)

The descriptions of the important environmental features in these option are given in Sections 4.22 and 4.3 respectively. The options are compared in Table 6-13.

The conclusion of the environmental consultants is that use of the South Pavilion segment would have greater impacts than use of the part of Pavilion.

TABLE 6-10
ORE VERSUS PART OF ANTOINE

ITEM	ORE (UV)		PART OF ANTOINE (ŮXV)
Length		38.0km	25.3km
ROW	New, isolated	38.0km	25.3km
Access	New	10.0km	13.0km
Roads	Existing	28.0km	12.3km
Terrain	Terrain conditions in 6 km of Ore Creek drainage are difficult. Moderate impact potential.		Terrain conditions in 9 km of Antoine Creek drainage are very difficult with high impact potential. This could be reduced by use of helicopter construction.
Land Use & Agriculture	Intrusion into rural settlement near Moha (5 km).		Intrusion into isolated settlement in Antoine Creek valley (1.5 km) and at Bridge River (0.5 km).
Forestry & Vegetation	Loss of productive forest lands in Leon Creek, Ore Creek and Yalakom River valleys for 21 km.		Loss of productive forest land for 8 km.
Fish	Low impact potential.		Low impact potential.
Wildlife	Opens new access route across Camelsfoot Range. High potential impact on wildlife.		Assuming helicopter use for construction in Antoine Creek Valley, no new road across Camelsfoot Range would be opened. Moderate potential impact as indirect impacts would be less.
Visual	High impact potential at Yalakom and Bridge River valley crossings. Recreation impact would be higher because of greater use of Yalakom and Bridge River raods.		High potential impact at Bridge River crossing and in Antoine Creek Valley.
Heritage	Higher impact potential on known sites. Higher potentail for undiscovered sites.		
Public Consultation	Strongly opposed by Yalakom Community Council, SLRD, and all outdoor groups.		Strongly opposed by Yalakom Community Council, SLRD, and all outdoor groups.

TABLE 6-11
BRIDGE/PART OF ANTOINE VERSUS PART OF PAVILION/MISSION

ITEM	BRIDGE/PART OF ANTOINE (F1XVG)		PART OF PAVILION/MISSION (F1FG)	
Length		29.3km		22.3km
ROW	New, isolated	29.3km	New, isolated	0.0km
	New, adjascent to other lines	0.0km	New, adjascent to other lines	22.3km
Access	New	25.0km	New	0.0km
Roads	Existing	4.3km	Existing	22.3km
Terrain	Impacts would be high as terrain is difficult. Dry conditions make site restoration difficult.		Impacts would be low as road access has been developed.	
Land Use & Agriculture	High potential impact on owners at Bridge River Crossing.		Incremental potential impact on land use in Bridge River IR1.	
Forestry & Vegetation	Low forestry impact potential but moderate to high potential vegetation impact on Camelsfoot Range and to dry forest parkland in Bridge River valley.		Moderate forestry impact potential on Mission Ridge.	
Fish	Low impact potential.		Low impact potential.	
Wildlife	High potential impact due to new access across Camelsfoot Range and long traverse of deer winter range in Bridge River valley.		Low impact potential due to existing lines.	
Visual	Severe potential visual impact for 12 km in Bridge River valley and high potential visual impact for 4 km at Bridge River crossing.		Moderate visual impact potential in Fraser Canyon. Low impact potential on Mission Ridge.	
Heritage	Low potential impact except at Bridge River crossing area.		Possible disturbance of known sites on Camelsfoot Range and in Bridge River IR1, one of very high improtance.	
Public Consultation	Opposition by Yalakom Community Council, by SLRD, and outdoor gruops.		Preferred by public, but requires ROW across Bridge River IR1.	

TABLE 6-12
EAST PAVILION VERSUS PART OF PAVILION

ITEM	EAST PAVILION (WW1DE)		PART OF PAVILION (WCE)	
Length		11.8km		11.0km
ROW	New, isolated	11.8km	New, isolated	0.0km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	6.5km
	Existing	0.0km	Existing	4.5km
Access Roads	New	3.0km	New	0.0km
	Existing	8.8km	Existing	11.0km
Terrain	New access roads on steep slopes in Pavilion River valley would have moderate impact. New crossing of Fraser Canyon would create new disturbance with difficulties in revegetation.		Low impact potential due to existing access system.	
Land Use & Agriculture	Crosses farm land in Pavilion River valley and on benches on east site of Fraser Canyon with potential for conflict with irrigation systems.		Crosses land with limited development potential.	
Forestry & Vegetation	Forest impact potential is low, but higher than for alternate because of greater length in forest zone.		Low potential impact due to dryness.	
Fish	Low impact potential.		Low impact potential.	
Wildlife	Moderate impact potential, but higher than for existing corridor because of extra access to, and disturbance of, sheep range.		Moderate impact potential due to construction activity in sheep range in Fraser Canyon.	
Visual	Route would add crossing of Pavilion River valley and highway. Severe potential visual impacts near node P in crossing three transmission lines close to railway and highway. Additional impact potential of new crossing of Fraser Canyone and traverse of bench on west side in full view of farm buildings.		Low incremental visual impact potential. Crossing of transmission lines screened by terrain from highway.	
Heritage	High resource potential off existing ROW's liable to be impacted.		Low impact potential, with protection of known sites.	
Public Consultation	No ROW required on Pavilion IR1. However, route visible from Pavilion Village.		Requires ROW on Pavilion IR1.	

TABLE 6-13
SOUTH PAVILION VERSUS PART OF PAVILION

ITEM	SOUTH PAVILION (WW1F1)		PART OF PAVILION (WCEF1)	
Length		13.5km		13.5km
ROW	New, isolated	13.5km	New, isolated	0.0km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	13.5km
Access	New	5.0km	New	0.0km
Roads	Existing	8.5km	Existing	13.5km
Terrain	Terrain in Fraser Canyon is more unstable than for other routes. Impacts would be moderate to high.		Low impact potential, assuming use of existing access roads.	
Land Use & Agriculture	Crosses ALR lands south of Pavilion and irrigated hayfields near Fraser Canyon. Crosses 5 km of developable land.		Low impacts are anticipated by following existing lines. Crosses 2.5 km of developable land.	
Forestry & Vegetation	Low potential impact on forestry but greater than Pavilion, as longer length in forest zone.		Low impact potential due to dryness of area.	
Fish	Low impact potential.		Low impact potential.	
Wildlife	Traverses known sheep range on east side of Fraser. Concern over disturbance.		Low potential impact.	
Visual	High visual impact because of two crossings of Highway 12, exposed location of transmission line crossings, visibility of traverse of bench on east side of Fraser from highway, and high visual impact of ascent of west side of Fraser Canyon in view from highway.		Low to moderate impact potential due to following existing line.	
Heritage	Crosses areas of high potential in Fraser Canyon and Pavilion Creek valley.		Low potential, if known sites protected.	
Public Consultation	Avoids Pavilion IR but route in view of Pavilion Village.		Requires ROW on Pavilion IR.	

6.14 PART OF PAVILION/BRIDGE (BWCEF1X) VERSUS PART OF ANTOINE (BUX)

The descriptions of the important environmental features are given in Sections 4.3, 4.20, and 4.4 respectively. The options are compared in Table 6-14.

The conclusion of the environmental consultants is that use of part of the Antoine segment has higher potential impacts than use of part of the Pavilion and Bridge segments, even though the former offers a route 4 km shorter. It should be noted that the Pavilion/Bridge option would have higher visual impact.

6.15 SETON SUB-OPTION

The key environmental aspects of this sub-option are compared with the alternate in Table 6-15.

The conclusion of the environmental consultants is that the route adjacent to 5L42 has less environmental impact, but the difference is marginal.

6.16 D'ARCY SUB-OPTION

The key environmental aspects of this sub-option are compared with the alternate in Table 6-16. In addition, other options were identified to the west of Anderson Lake IR5, and threading between 5L42, 3L2, and 2L2. Neither of these is attractive in terms of visual impact.

The conclusion of the environmental consultants is that the route adjacent to the existing transmission lines is far preferable to the alternate because of the severe visual impact of the latter. This is confirmed by representatives of Anderson Lake Band.

6.17 LOKLA SUB-OPTION

There are no environmental constraints in comparison of these options, as shown in Table 6-17. The sub-option would bring the line closer to the highway, or even cross it, but in this section the lines are currently highly visible from the highway, and no change in degree of visual impact is anticipated.

6.18 FUNCTION SUB-OPTION

The key environmental aspects of this option are compared with the alternate in Table 6-18.
The conclusion of the environmental consultants is that the sub-option route has less adverse impacts than the alternate route adjacent to 5L42.

TABLE 6-14
PART OF PAVILION/BRIDGE VERSUS PART OF ANTOINE

ITEM	PART OF PAVILION/BRIDGE (BWCEF1X)		PART OF ANTOINE (BUX)	
Length		41.0km		34.0km
ROW	New, isolated	19.0km	New, isolated	34.0km
	New, adjascent to other lines	9.0km	New, adjacent to other lines	0.0km
	Existing	13.0km	Existing	0.0km
Access Roads	New	19.0km	New	34.0km
	Existing	22.0km	Existing	34.0km
Terrain	The crossing of the Camelsfoot Range requires 5 km of construction on difficult terrain with potential for high impact.		Construction in Cavanagh Creek valley, Fraser Canyon, and the descent of Antoine Creek valley, requires 12 km of construciton on difficult terrain with potential for high impact.	
Land Use & Agriculture	On Diamond S Ranch crosses 2 km of irrigated land, 1 km of pasture, and 4 km of range within ALR. On Pavilion IR1, 4 km of range in ALR is crossed. High potential impact at small area of settlement at Bridge River crossing.		Crosses 3 km of ALR rangelands on west side of Fraser and Commune lands in DL 3223 in Antoine Creek valley creating a severe intrusion for this isolated settlement.	
Forestry & Vegetation	Forestry and vegetation potential impacts are low.		Forest impact potential is moderate, but wilderness loss would be high in Antoine Creek valley. Sensitive sites extend for 8 km.	
Fish	Low potential impact.		Low potential impact.	
Wildlife	Low potential impact except in Camelsfoot Range. Here, route lies for 19 km in highly valued deer range with high impact potential.		New access allows intrusion into bighorn sheep range in Fraser Canyon, and wild life habitat in Antoine Creek valley.	
Visual	Severe potential visual impact in Bridge River valley as line traverses dry forest parkland on sidehills and at homes near Bridge River crossing.		Moderate potential visual impact in Antoine Creek valley, high impact near Bridge River crossing and at DL 3223. Loss of wilderness values in Antoine Creek valley.	
Heritage	Route is near sites of high potential on Pavilion Mountain and in Fraser Canyon.		Route traverses sites of major importance in Kelly Creek valley and crosses area of high potential on west side of Fraser Canyon.	
Public Consultation	Yalakom Community Council opposes this route.		Route passes close to Kelly Lake IR 3, no opinion has been expressed by Band. SLRD and Yalakom Community Council oppose this route, as do outdoor groups.	

TABLE 6-15
SETON SUB-OPTION

ITEM	SUB-OPTION		ADJACENT 5L42	
Length		5.5km		5.5km
ROW	New, isolated	5.5km	New, isolated	5.5km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	0.0km
Access	New	3.0km	New	3.0km
Roads	Existing	2.5km	Existing	2.5km
Terrain	Low potential impact as access roads exist.		Traverses steep terrain, with moderate potential for erosion.	
Land Use & Agriculture	No impact potential.		No impact potential.	
Forestry & Vegetation	Reduces forestry potential of Reserve Land.		Reduces forestry potential of Crown Land.	
Fish	No impact potential.		No impact potential.	
Wildlife	No impact potential.		Greater impact potential due to development of new access road.	
Visual			Greater impact potential due to need for 2 extra crossovers on 5L42 and extra ROW on sidehill.	
Heritage	Low potential impact.		Low potential impact.	
Public Consultation	Requires ROW on Seton lake IR 5A.		Avoids Seton Lake IR 5A.	

TABLE 6-16
D'ARCY SUB-OPTION

ITEM	SUB-OPTION (H1H2)		ADJACENT EXISTING LINES (H1HH2)	
Length (including 1.5 km over lake)		13.5km		12.0km
ROW	New, isolated	13.5km	New, isolated	3.0km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	4.0km
	Existing ROW	0.0km	Existing ROW	5.0km
Access	New	10.0km	New	1.0km
Roads	Existing	1.0km	Existing	11.0km
Terrain	Low impact potential.		Low impact potential.	
Land Use & Agriculture	South terminal of lake crossing would be above, and close to, recreational subdivision. Creates planning restraint on east side of D'Arcy, conflicts with SLRD planning objectives.		Release of 2L1 ROW would free developable land in D'Arcy. Conforms to SLRD planning objectives.	
Forestry & Vegetation	Traverses 10 km of forest land.			
Fish	No impact potential.		No potential impact.	
Wildlife	Moderate potential impact due to construction of more roads.		Low potential impact.	
Visual	Severe potential visual impact on recreation subdivision at south end of lake crossing, and for all waterfront development and use at D'Arcy.		Moderate incremental visual impact in views to west of D'Arcy.	
Heritage	Moderate potential impact, heritage potential not surveyed.		Low potential impact.	
Public Consultation	Avoids reserves of Anderson Lake Band.		Requires ROW on Nequatque IR1, but would release 2L1 ROW on same resrve. This route is preference of Anderson Lake Band.	

TABLE 6-17
LOKLA SUB-OPTION

ITEM	SUB-OPTION		EXISTING ROW	
Length		0.4km		0.3km
ROW	New, isolated	0.4km	New, isolated	0.0km
	Existing	0.0km	Existing	0.3km
Access	New	0.0km	New	0.0km
Roads	Existing	0.4km	Existing	0.3km
Terrain	ROW would rise onto sidehill, low potential impact.		Existing ROW crosses rockslide debris on valley floor. Low potential impact.	
Land Use	In highway corridor, off reserve.		Within Lokla IR4, but not in an area suitable for use.	
Forestry & Vegetation	Low potential impact.		No potential impact.	
Fish & Wildlife	No potenital impact.		No potential impact.	
Visual	New double crossing of highway required in area with many crossings. 2L2 would remain over slide debris on reserve.		Low incremental impact due to taller structures.	
Heritage	Potential exists at new crossing of Cheakamus River.		No potential impact.	
Public Consultation	No opinion recorded.		Mt. Currie Band objects to use of resreve by transmission lines, railway, and road.	

TABLE 6-18
FUNCTION SUB-OPTION

ITEM	SUB-OPTION		ADJACENT 5L42	
Length		3.3km		3.0km
ROW	New, isolated	1.6km	New, isolated	0.0km
	New, adjascent to other lines	0.0km	New, adjacent to other lines	3.0km
	Existing	2.7km	Existing	0.0km
Access	New	0.0km	New	0.0km
Roads	Existing	0.0km	Existing	0.0km
Terrain	Low impact potential.		Crosses Miller Creek wetlands, requires foundation in wetlands.	
Land Use & Agriculture	Use of existing ROW adjacent to industrial area and across gravel pits and dump creates no land use conflict.		Requires ROW adjacent to sewage plant, possibly constraining future expansion and removing screening.	
Forestry & Vegetation	Low impact potential.		Requires clearing more of mature conifers behind Whistler Museum and at start of Cheakamus Lake road, which is a pleasing natural feature at entrance to Whistler.	
Fish & Wildlife	No potential impact.		Requires construction in wetlands.	
Visual and Recreation	Crossing of Highway 99 is well located. Use of 2L1 ROW behind an industrial area conceals 2 km of line at entrance to Whistler. Route across valley floor on gravel pit is well screened from Highway. Allows a less intrusive crossing of 5L42 west of Whistler. Avoids impairing westward view from houses on Cheakamus River.		Crossing of Highway 99 by 5L42 and 5L46 would be much more obvious than present single line crossing. Potential visual impacts at start of Cheakamus Lake Road would be much higher. Further clearning of stand of mature trees at Whistler Museum would reduce natural appeal of this key entrance to Whistler and reduce screening of sewage plant from Cheakamus Lake road.	
Heritage	Low impact potential.		Low impact potential.	
Public Consultation	Sub-option proposed by resident of Whistler.		Low impact potential.	

6.19 CALLAGHAN/HIGH CHEAKAMUS (N1Y2ZT) VERSUS PART OF RAINBOW/UPPER CHEAKAMUS/LOWER CHEAKAMUS (N1NPQRSZT)

This comparison is necessary if the route selected involves use of the Soo and Rainbow segments instead of the Whistler segment.

In this comparison it is assumed that the route used through the Lower Cheakamus segment is the environmentally favoured route, namely PQRSZT. The options are compared in Table 6-19.

It is the opinion of the environmental consultants that use of the Callaghan/High Cheakamus route would have higher initial direct impacts due to erosion after clearing, but that in the long term its use would have lower visual impact and create less restraint on use of the limited amount of land suitable for development. Use of the High Cheakamus route is favoured, although it should be noted that if this route is used in combination with the Soo and Rainbow segments, 2L1 may be retained south of Rainbow substation.

6.20 HIGH CHEAKAMUS (YY2ZT) VERSUS PART OF WHISTLER/UPPER CHEAKAMUS/LOWER CHEAKAMUS (YNPQRSZT)

This comparison is necessary if the route selected involves use of the Whistler segment instead of the Soo and Rainbow segments.

In this comparison it is assumed that the route used through the Lower Cheakamus segment is the environmentally favoured route, namely PQRSZT. The options are compared in Table 6-20.

As for the comparison in Section 6.19 the environmental consultants believe that the short term physical impacts of use of the High Cheakamus route are, due to its location, greater than for the alternate. However, if the long term view is taken of land use and visual concerns then the High Cheakamus route is more attractive. It should be noted that if the High Cheakamus route is used in conjunction with the Whistler segment, 2L1 would be removed south of Rainbow substation.

6.21 SOO/PART OF RAINBOW/CALLAGHAN (LMN1Y2) VERSUS PART OF WHISTLER (L1YY2)

If it is decided to use the High Cheakamus segment, then it is necessary to review again the alternatives near Whistler. The comparison is made in Table 6-21.

The environmental consultants concluded that if the High Cheakamus route is used, that decision favours use of the route through Whistler. The environmental difference between the options remain as discussed in Section 6.8, with the following differences:

(1) Whistler route is 6 km shorter presenting less direct impacts.

(2) Whistler route avoids all land use and visual conflicts in Lower Callaghan Valley.

(3) Use of Whistler route avoids a further crossing of Cheakamus River valley, Highway 99, and of 2L2 and 5L42.

TABLE 6-19
CALLAGHAN/HIGH CHEAKAMUS VERSUS PART OF RAINBOW/UPPER AND LOWER CHEAKAMUS

ITEM	CALLAGHAN/HIGH CHEAKAMUS (N1Y2ZT)		PART OF RAINBOW/UPPER AND LOWER CHEAKAMUS (N1NPQRSZT)	
Length		39.5km		37.0km
ROW	New, isolated	35.7km	New, isolated	19.4km
	New, adjacent to other lines	3.8km	New, adjacent to other lines	1.8km
	Existing	0.0km	Existing	15.8km
Access roads	New	5.0km	New	0.0km
	Existing	34.5km	Existing	37.0km
Terrain:	In this option, 28 km are on sidehill slopes of varying steepness and 11 km are in the valley. The potential impacts on terrain are low to moderate, as most necessary access roads have already been developed for forestry, except near Brohm Lake where helicopter construction may be required over rock knolls, as for 5L42. Erosion potential is high on steep sidehills.		In this option, 10 km are on sidehill slopes of varying steepness and 27 km are in the valley. The potential impacts on terrain are low on the valley floor sections and on the sidehill sections which mostly consist of bare rock, as in the Cheakamus canyon and at Brohm Lake. Helicopter construction would be required in canyon.	
Land Use and Agriculture:	There is no agricultural interest. This option reduces conflict with Gov't proposals for development in Callaghan Valley. Route may conflict to minor degree with BCR basalt quarry adjacent to Highway 99. Route crosses DL2559 and 2660, which are undeveloped and would leave homes on DL2605 and 424 near Swift Creek with a 500 kV line on east side of them. Route occupies 2 km in DL1817 and 1818 on Cheekye Creek, which have some limited development.		This option has greatest potential impact on developable lands in Callaghan Valley. Route passes close to Pinecrest and Black Tusk subdivisions, but 5L46 would not be the closest transmission line to them. Route crosses land with development potential at Lucille Lake, and passes close to Butterfly Lake recreation subdivision. Route passes close to homes in Lower Cheakamus valley and occupies valley floor land with development potential.	
Forestry and Vegetation:	Low to moderate potential impact, due to poor site quality on most of route. Extension of forest access roads since 1984 has reduced cost of High Cheakamus route.		Route occupies 2 km in DL1817 and 1818 on Cheekye Creek which have some limited development. Low potential impact due to use of existing ROW and use of poor sites in Cheakamus Canyon, where stunted trees are important in view of Tantalus Range from Highway 99.	
Fish:	Route parallels Cheakamus Creek on sidehill, greater risk of erosion and adverse siltation on Cheakamus River.		Route parallels Cheakamus River but largely on valley floor. Less risk of siltation.	

TABLE 6-19 Cont'd.
CALLAGHAN/HIGH CHEAKAMUS VERSUS PART OF RAINBOW/UPPER AND LOWER CHEAKAMUS

ITEM	CALLAGHAN/HIGH CHEAKAMUS (N1Y2ZT)		PART OF RAINBOW/UPPER AND LOWER CHEAKAMUS (N1NPQRSZT)
Length		39.5km	37.0km
ROW	New, isolated	35.7km	19.4km
	New, adjacent to other lines	3.8km	1.8km
	Existing	0.0km	15.8km
Access roads	New	5.0km	0.0km
	Existing	34.5km	37.0km
Wildlife:	Route passes through areas of Class 3 and 4 capability for deer. ROW would increase habitat diversity.		Route is on more productive land on valley floor. It would require cutting of trees along ROW near Cheakamus River below canyon which may adversely affect eagles.
Visual and Recreation:	Valley, at crossing of Highway 99 near BCR quarry, at Rubble Creek, and in short sections near Highway 99. Visual impact potential in Callaghan Valley would be moderate, in other areas low to moderate, as line would be on side of valley away from major views so it does not intrude into them. Route has low impact potential on recreation, but crosses the Rubble Creek extension to Garibaldi Provincial Park. The crossing of the park access road is well screened and the ROW clearing and towers will not be visible from the Barrier viewpoint. However MOP have concerns on location and design at this important entrance to a major park. Line does not intrude into view of Black Tusk from Pinecrest Estate.		Route is usually sensitive in Callaghan Valley, at Pinecrest and Black Tusk subdivisions, along west side of Daisy Lake where it is seen against view of Cloudburst Mountain, in B.C. Hydro's former recreation area at Daisy Lake, near Lucille Lake, at the salt sheds, and in the Cheakamus Canyon where it can be seen at a low elevation in the view of the Tantalus Range, and in the Lower Cheakamus Valley. Visual impact in Callaghan Valley, At Pinecrest, black Tusk and along Daisy Lake, would be high. Visual impact at salt sheds and in Cheakamus Canyon would be high. Impact in Lower Cheakamus valley is assessed as moderate due to larger structures and more clearing. Route would affect recreation opportunities in B.C. Hydro's recreation area at Stanley Lake, as it traverses the campsite, and at brohm Lake where it would affect view of Lower Cheakamus valley from bluffs to west of lake.
Heritage:	Low impact potential.		Route is close to mythological site 'Wountie' opposite North Vancouver School.
Public Consultation:	Route is favoured by residents of Lower Cheakamus valley and Pinecrest and Black Tusk subdivisions.		Use of Section QR is opposed by residents of Lower Cheakamus valley.

TABLE 6-20
HIGH CHEAKAMUS VERSUS PART OF WHISTLER/UPPER AND LOWER CHEAKAMUS

ITEM	HIGH PART OF WHISTLER/ CHEAKAMUS (YY2ZT)		UPPER AND LOWER CHEAKAMUS (YNPQRSZT)	
Length		36.6km		36.0km
ROW	New, isolated	32.8km	New, isolated to	17.4km
	New, adjacent to other lines	3.8km	New, adjacent to other lines	
	Existing	0.0km	Existing	2.8km
Access	New	4.0km	New	15.8km
Roads	Existing	32.6km	Existing	6.0km
				30.0km
Terrain	Low impact potential.		Low impact potential.	
Land Use & Agriculture			Requires ROW through eastern fringes of Brandywine Provincial Park and adjacent UREP reserve.	
Forestry & Vegetation	Same impact potential as alternate.		Same impact potential as alternate.	
Fish & Wildlife	Low impact potential.		Low impact potential.	
Visual and Recreation	Route is away from areas of recreation interest and Highway 99.		Route crosses eastern fringe of Brandywine Provincial Park, adjacent UREP, Highway 99, and Daisy Lake.	
Heritage	Low impact potential.		More potential impact on Cheakamus valley floor.	
Public Consultation	Residents of Lower Cheakamus valley prefer this route.			

South of node N, the issues are same as listed in Table 6-19. This table is restricted to issues north of node N.

TABLE 6-21
SOO/PART OF RAINBOW/CALLAGHAN
VERSUS PART OF WHISTLER

ITEM	SOO/PART OF RAINBOW/ CALLAGHAN (LMN1Y2)		PART OF WHISTLER (LYY2)	
Length		38.7km		33.1km
ROW	New, isolated	38.7km	New, isolated	12.4km
	New, adjacent to other lines	0.0km	New, adjacent to other lines	4.8km
	Existing	0.0km	Existing	15.9km
Access	New	12.0km	New	2.0km
Roads	Existing	26.7km		31.1km
Terrain	Low impact potential, but route is 6 km shorter.		Low impact potential, but route is 4 km shorter.	
Land Use	Traverses fringe of proposed residential/golf area in Lower Callaghan Valley. Possible conflict with BCR quarry.		No land use concerns.	
Forestry & Vegetation	Low impact potential.		Low impact potential.	
Visual & Recreation	Requires crossing of Cheakamus River valley floor, Highway 99, BC Railway, 5L42 and 2L2, the latter in an exposed location near the highway.		Low impact potential.	
Heritage	Low impact potential.		Low impact potential.	
Public Consultation	No opinion recorded.		No opinion recorded.	

North of node N1, the issues are same as listed in Table 6-8. This table is restricted to issues south of node N1.

6.22 PINECREST NORTH (Y1N2) VERSUS PINECREST EAST (Y1YN2)

This comparison resulted from a request by a resident of Pinecrest Estates to avoid the northern part of High Cheakamus route. The proposal included the Pinecrest North section, but B.C. Hydro, after review, concluded that the Pinecrest East option had possible merit on technical and evironmental grounds. The comparison is made in Table 6-22.

The environmental consultants concluded that the Pinecrest East option was preferable on the following grounds:

(1) Lesser visual impact along Highway 99.

(2) Lesser visibility north of Function Junction.

(3) Use of 2L1 ROW and Function Junction.

(4) Avoidance of developable land in Lower Callaghan River valley.

(5) Route is on flatter terrain resulting in less disturbance.

6.23 PINECREST (YN2P1) VERSUS PART OF HIGH CHEAKAMUS (YY2P1)

This comparison was requested by a resident of Pinecrest Estates. The comparison is made in Table 6.23.

The environmental consultants concluded that the Pinecrest option, adjusted to use the Pinecrest East suboption, was less preferable than the High Cheakamus option for the following major reasons:

(1) Pinecrest is 2.7km longer.

(2) Pinecrest requires two crossings of Cheakamus River valley floor with associated crossings of Highway 99, B.C. Rail, 2L2 and 5L42 (one).

(3) Pinecrest intrudes into area of high recreation use at Shadow and Stanley Lakes.

TABLE 6-22
PINECREST NORTH VERSUS PINECREST EAST

ITEM	PINECREST NORTH (Y1N2)		PINECREST EAST (Y1YN2)	
Length		8.5km		8.3km
ROW	New, isolated	5.0km	New, isolated	3.9km
	New, adjacent to other lines	3.5km	New, adjacent to other lines	2.7km
	Existing	0.0km	Existing	1.7km
Access	New	0.0km	New	0.0km
Roads	Existing	8.5km	Existing	8.3km
Terrain	Route is on sidehill for most of its length.		Route is largely on valley floor.	
Land Use	Route crosses land proposed for development in Callaghan Valley for 2 km.		No land uses concerns.	
Forestry & Vegetation	Potential impacts are low to moderate.		Potential impacts are low to moderate.	
Fish & Wildlife	Low impact potential.		Low impact potential.	
Visual & Recreation	Visually prominent along Highway 99.		Requires two crossings of Highway 99, but locations are favourable.	
	Route above Function Junction will be more visible.		Requires crossing of 2L2 near Highway 99.	
	Further impacts staging area at Callaghan Lake road junction.			
Heritage	Low impact potential.		Low impact potential.	
Public Consultation	Proposal by resident of Pinecrest Estates.		No public input.	

TABLE 6-23
PINECREST VERSUS PART OF HIGH CHEAKAMUS

ITEM	PINECREST (YN2P1)		PART OF HIGH CHEAKAMUS (YY2P1)	
Length		19.5km		16.8km
ROW	New, isolated	16.8km	New, isolated	16.8km
	New, adjacent to other lines	2.7km	New, adjacent to other lines	0.0km
	Existing	0.0km	Existing	0.0km
Access	New	5.0km	New	4.0km
Roads	Existing	14.5km	Existing	12.8km
Terrain	Low impact potential.		Low impact potential.	
	Requires crossing of Rubble Creek Hazard Area.		Provides safe crossing of Rubble Creek Hazard Area.	
Land Use & Agriculture	Requires 2 crossings of Cheakamus River valley floor. Development potential at each crossing is very limited.		Crosses Rubble Creek extension of Garibaldi Provincial Park.	
	Intrudes into B.C. Hydro's recreation site as Shadow Lake.			
Forestry & Vegetation	Impact potential is moderate.		Impact potential is moderate.	
Fish & Wildlife	Impact potential is low.		Impact potential is low.	
Visual	At north highway crossing 2L2 must be crossed adjacent to Highway with high visual impact.		Crosses Rubble Creek extension to Garibaldi Provincial Park with high span. Clearing not required on valley floor. MOP has concerns over design and location at this important entrance to a major park.	
	At south highway crossing, 5L42 must be crossed close to highway, with high visual impact.		Visible for a short length in view from Black Tusk, but at a distance.	
	Recreation impacts at Shadow and Stanley Lakes.		Minor intrusion into view from Pinecrest.	
Heritage	Low impact potential.		Low impact potential.	
Public Consultation	Proposed by residents of Pinecrest Estates.		No public opinion recorded for this section.	

6.24 CONCLUSIONS

In assembling the data for these comparisons it became evident in October 1989 that there was a general coincidence between the opinions of the environmental consultants and those expressed by the public, recognizing that firm opinion had yet to emerge at Whistler and the Lower Cheakamus valley, and that the Indian Bands had not yet expressed their opinion.

The similarity between general public opinion and that of the environmental consultants is seen as significant and adds confidence to the analysis of the route network. The network reviewed in 1989 is very readily analyzed by a process of reduction through successive choices, as follows:

Step 1 Adopt opinions on Fraser crossing, eliminate south sub-option.

Step 2 Adopt opinions on Antoine versus Pavilion/Mission, eliminate former.

Step 3 Adopt opinions on Duffey versus Mission/Anderson/Gates, eliminate former.

Step 4 Adopt opinions on Antoine/Anderson/Gates versus Pavilion/Duffey, reject latter. However from Step 2 Pavilion/Mission is preferred to Antoine, so to be consistent with Step 2 preference becomes Pavilion/ Mission/Anderson/Gates which is also consistent with Step 3.

Step 5 Adopt opinions on Birkenhead/Owl versus Gates/Pemberton, eliminate former.

Step 6 Adopt opinions on Birkenhead/Ryan/Rainbow versus Gates/Pemberton/Green/Whistler, eliminate former.

Step 7 Given public uncertainty at Whistler, keep both options open, although recognising environmental consultants' opinion in favour of route through Whistler.

Step 8 Adopt environmental opinion on Lower Cheakamus west versus valley, eliminate former.

Step 9 Adopt environmental opinion on Lower Cheakamus south versus valley, eliminate latter.

Step 10 Adopt environmental opinion on Lower Cheakamus east versus valley, eliminate former.

Following these steps the route identified in October 1989 became:

AB	Kelly Lake
BCEF	Pavilion
FG	Mission
GH	Anderson
HJ	Gates
JK	Pemberton
KL	Green

LN	Whistler, with option retained for use of Soo/Rainbow route
NP	Upper Cheakamus
PQRST	Lower Cheakamus

This 'generally favoured route' conforms to the existing transmission line corridor, except if the Soo/Rainbow option were adopted. It should be noted that the Soo/Rainbow option can still be carried forward in project planning until a firm opinion emerges at Whistler, without disturbing planning for other portions of the route.

The work done in 1990 resulted in the modification of the conclusions reached in 1989. The 1990 studies focused on possible revisions to the generally favoured route at Seton, D'Arcy, Lokla, Function, Callaghan, Pinecrest, and High Cheakamus, and on ways to avoid the Pavilion and Bridge River Indian Reserves and the Antoine Creek valley at the north end of the project.

For the revisions to the network reviewed in 1990, the following conclusions were reached in the southern portion of the project.

(A1) Seton — The proposed bypass to Seton Lake IR5A would have marginally higher environmental impacts than the route through the reserve, but the impacts are acceptable.

(A2) D'Arcy — The D'Arcy sub-option bypassing the Indian Reserve would create severe visual impacts, because the crossing of Anderson Lake would be in full view of the community. Use of the sub-option would result in a less desirable route as compared to the generally favoured route. Other bypass options were also not attractive.

(A3) Lokla — The proposed bypass to Lokla IR4 could be achieved with a minimum of environmental impact.

(A4) Function — The Function sub-option is preferable to the route identified and reviewed in 1989, and should be adopted.

(A5) High Cheakamus — Environmental studies concluded that in the short term use of this route would have higher physical impacts than use of the alternate route through the Lower Cheakamus valley, but that the project could be constructed on the route within acceptable levels of environmental impact. MOP concerns at Rubble Creek must be addressed.

However, given the very rapid change in land use experienced in the whole corridor between Whistler and Squamish, it is also concluded that in the long term view the High Cheakamus route is the better location for a 500kV transmission line with an effective life of at least 50 years. Benefits to land use would occur at Brandywine Falls Provincial Park, Black Tusk Village, Pinecrest, Stanley Lake, Lucille Lake, and in Lower Cheakamus Valley. From an overall environmental perspective, it is recommended that the High Cheakamus route be adopted in preference to a route through the Upper and Lower Cheakamus segments.

It is further concluded that if the High Cheakamus route is adopted, the route through Whistler becomes more favourable environmentally than the Soo/Rainbow route.

(A6) Pinecrest — The environmental studies concluded that the Pinecrest diversion from the High Cheakamus route was less desirable in terms of land use and visual impact, and that use of east suboption did not change this conclusion.

(A7) Callaghan — If the Soo/Rainbow bypass for Whistler is selected together with the High Cheakamus route, it is concluded that the Callaghan segment would be an environmentally acceptable link between them.

In consideration of the revisions to the network reviewed in 1989 and 1990 at the north end of the project, the following conclusions were reached:

(B1) If it is desired to bypass Pavilion IR1, the East Pavilion route is preferred for environmental reasons than the South Pavilion route. Construction on the East Pavilion route could be done within an acceptable level of impacts, but with higher visual and other impacts than use of the generally favoured route. The opinion of the Indian Bands on this route is not known.

(B2) If it is desired to bypass Bridge River IR1 a route through the Bridge segment would have least impact, although the impacts would be greater than for the generally favoured route. The Yalakom Community Council is strongly opposed to this route and the opinion of the Indian Bands is not known.

(B3) If it is desired to bypass both Pavilion IR1 and Bridge River IR1, a route through the East Pavilion and Bridge segments would have least impact. The impacts would however be high and significantly greater than for the generally favoured route. The opinion of the Indian Bands is not known.

(B4) If it is desired to bypass the Antoine Creek Community no route reviewed is acceptable to the Yalakom Community Council other than the generally favoured route through Pavilion IR1 and Bridge River IR1.

(B5) If it is desired to bypass both Pavilion IR1 and the Antoine Creek valley, the generally favoured route, modified to use the East Pavilion segment, would have least impact.

(B6) If it is desired to avoid both Bridge River IR1 and the Antoine Creek valley use of the Bridge segment would have least environmental impact. Its use is opposed by Yalakom Community Council.

(B7) If it is desired to bypass Pavilion IR1, Bridge River IR1, and the Antoine Creek valley, the only options are the Ore/Antoine and East Pavilion/Bridge/Antoine routes. Of these the latter has the lower impacts, but still much higher than those of the generally favoured route. The opinion of the Indian Bands is not known. This route is opposed by the Yalakom Community Council.

After review of the 1989 and 1990 environmental studies and the results of the public consultation program, B.C. Hydro has concluded that there is still strong merit from the environmental and public perspective in use of the generally favoured route identified in 1989, modified to use the Function sub-option and the High Cheakamus segment.

As it has not yet been possible to ascertain the views of the Indian bands, other than the Anderson Lake Band, and as a consensus on routing has not yet emerged at Whistler, it is proposed by B.C. Hydro to retain consideration of options in these areas, as follows:

Pavilion IR1	- Use of East Pavilion option (WW1DE)
Bridge River IR1	- Use of Bridge/Antoine option (F1XVG)
Seton IR5	- Use of Seton sub-option (G1G2)
Lokla IR4	- Use of Lokla sub-option
Whistler	- Use of Soo/Rainbow/Callaghan option (LMN1Y2)

7.0 REMOVAL OF 2L1 TRANSMISSION LINE

7.1 GENERAL

The 2L1 230kV transmission line was constructed to transmit electricity from the Bridge River Plant of B.C. Electric in 1948. It is most readily identified by the fact that, of the transmission lines in the corridor, it is the only one to have three single conductors. Its towers are all of steel lattice design, except for a 3 km section west of Alta Lake at Whistler which is on wood poles. Its ROW is in a mature state with a good cover of low vegetation in most areas.

Removal of 2L1 would permit use of its ROW for 5L46 in certain key areas, such as along Anderson Lake and through Whistler, to minimize environmental impact.

The general policy and conditions for removal of 2L1 and release of the sections of the 2L1 ROW and disposition of any 2L1 fee-owned property not required for the new project, or other reasons, are given in Section 7.2.

Where 2L1 is to be removed, it would probably occur in the same period as the ROW clearing and the construction of foundations for 5L46. It should be appreciated that although the 2L1 ROW is 200 feet wide, additional clearing may be necessary to accommodate 5L46, and that the location of 5L46 may have to be moved from the present location of 2L1, because 2L1 is not in the centre of its ROW, for details of line and ROW geometry see the technical report[3].

7.2 POLICIES FOR RELEASE OF 2L1 ROW

The policies which will be followed are:

For Right of Way Easements:

(1) **Definition of Surplus ROW**

A right of way, or portion thereof, is considered surplus if the right of way, in B.C. Hydro's opinion, is not required for present or possible future use by B.C. Hydro, in serving its customers.

(2) **Policy**

A right of way that is considered surplus may be released in whole or in part. B.C. Hydro will waive normal recovery of the costs incurred in preparing and registering the release, including legal survey, plan preparation and documentation charges for the subject portions of right of way of 2L1.

For Property Owned by B.C. Hydro:

(1) **Definition of Surplus Property**

B.C. Hydro fee-owed property held in connection with 2L1, or portions thereof, is considered surplus if, in B.C. Hydro's opinion, it is not required for present or possible future use by B.C. Hydro, in serving its customers.

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[3] B.C. Hydro Transmission Engineering Division, Kelly Lake-Cheekye 500kV Transmission Line Technical Report, March 1991.

(2) **Policy**

Fee-owned property that is considered surplus may be disposed of in whole or in part in such manner as to maximize returns to B.C. Hydro and its rate payers.

Applying these general policies in more detail yields the following comments:

(1) **Shalalth to Rainbow Substation**

Release of the 2L1 ROW / Disposition of 2L1 Property:

Transmission line 2L1 will be removed from the Bridge River Generating station at Shalalth to the Rainbow Substation at Whistler. Its right-of-way will be released in whole or in part if it is not required for present or possible future use by B.C. Hydro in serving its customers. In the case of "fee-owned" property held in connection with 2L1, and if it is not required for present or possible future use by B.C. Hydro, the property will be disposed of in whole or in part in such a manner as to maximize returns to B.C. Hydro and its rate payers.

(2) **Rainbow Substation to Cheekye**

South of Rainbow Substation and through the Resort Municipality of Whistler (RMOW), the removal of 2L1 will depend on which route is eventually used. If the route through the RMOW is affirmed, then 2L1 will be removed between Rainbow and Cheekye and part of its ROW used for the proposed 500 kV transmission line. The release of unused portions of the 2L1 ROW and disposition of unused 2L1 fee-owned property will be in accordance with the stated policies.

If the Soo/Rainbow route together with the High Cheakamus route option were to be used, there may be advantages to B.C. Hydro in leaving 2L1 in place between Rainbow and Cheekye substations.

7.3 PROPOSED METHODS OF REMOVAL

Removal of 2L1, or portions thereof, would be organized in the following stages:

- Removal and salvage of conductors, insulators and hardware.
- Removal and salvage of towers.
- Site restoration and revegetation.

Salvage of the conductors requires specialized truck mounted reeling equipment which would require road access to the ROW at about 5km intervals.

For the towers set on soil, most are mounted on buried steel grillage foundations. It is intended therefore to cut the legs of the towers at 0.5m below ground level, remove the towers for scrap, and backfill the holes. It is considered that a depth of cover of 0.5m is adequate to prevent the abandoned foundation creating problems for future users of the land, whether in forestry or agriculture. Where the towers are set on rock the anchor bolts would be cut flush with the top of the concrete pads and the tower removed.

On private property, the landowner would be asked to decide how the foundations are to be left.

As 2L1 was erected in a relatively easy location, B.C. Hydro considers it probable that the towers would be taken apart on site, loaded on trucks and removed from site. This requires development of road access to every tower. Most of these access roads exist, but some new ones will be necessary. It is possible that it might be more efficient to lift each tower out by helicopter after it has been freed from its foundation, but that decision would be left to the successful tenderer and would depend on the lifting capabilities and availability of large helicopters, proximity to other energized lines and safety considerations.

After removal of the tower, the holes at each tower leg would be backfilled, the ground surface seeded, and any access road specifically constructed for removal of the tower would be restored and seeded.

7.4 ENVIRONMENTAL ISSUES

(a) General

The Squamish Forest District of the Ministry of Forests has requested the following steps be taken on any section of the 2L1 ROW on Crown land under Ministry of Forests jurisdiction which would be abandoned:

(1) The ROW easement be released and the land revert to Provincial Forest status.

(2) B.C. Hydro have a 'silvicultural prescription' prepared by a professional forester to establish a commercial crop of timber on the ROW.

(3) The ROW be managed by B.C. Hydro, at their expense, until a free growing crop of trees is established.

B.C. Hydro accepts forestry as the most appropriate use of the land within a Provincial Forest and accepts the responsibility of replanting areas of abandoned 2L1 ROW that are not stocked with young conifers. B.C. Hydro accepts the responsibility to tend any young trees planted under this arrangement with the Crown until they reach 'free to grow' status.

Where the ROW lies on Crown land in the jurisdiction of another Ministry, B.C. Hydro would negotiate treatment of the released ROW with them. Where the ROW is on private land or Indian Reserve, B.C. Hydro would negotiate the treatment of the released ROW with the owner or Band.

B.C. Hydro will plan the road access system for any removal of 2L1 as part of the system for the 5L46 project to minimize duplication of access roads and consequent environmental impact. Where an access road is provided to the 2L1 ROW and is not needed for construction and aintenance of 5L46, that access road would be restord after removal of 2L1.

(b) **Site Specific Issues**

These are listed from north to south with km 0 at the Shalalth substation. In this list it is assumed 2L1 is removed for its full length. As explained in Section 7.2, 2L1 may ultimately only be removed from Shalath to Rainbow Substation (km 0 to km 89).

km 0-6 Shalalth to Seton Portage (6km)

This section of ROW would be released to the Seton Lake Indian Band, or private owners. This section is very rich in heritage sites. Before the line is removed a heritage survey would be made and the heritage sites marked and protected during the removal.

The vegetation cover would be left as it is.

km 6-25 Anderson Lake (19km)

This section of ROW is proposed for use by 5L46. The environmental concerns are the control of access roads for removal of 2L1 and the protection of the many private water supply systems crossing the ROW.

It is desired to retain as much as possible of the narrow bands of trees between the ROWs in this section, as they provide important cover for wildlife. Any new access road should minimize the loss of trees in these bands. Where the 2L1 ROW is close to the 3L2 ROW, it would be preferred that any additional clearing necessary be on the opposite side of the 2L1 ROW to 3L2.

km 25-30 D'Arcy (5 km)

This section of ROW would be released to the Anderson Lake Indian Band and private owners. The ROW lies within the village and along the highway approach to it. The objective would be to remove 2L1 with the minimum of disturbance.

This is another section with heritage sites. Sites EdRo 27 and 28 would be marked prior to removal of 2L1, to prevent damage. A heritage inspection would be made before removal.

In this section B.C. Hydro owns DL8354 (1ha) which was the site of the old Devine substation. If still available and if it is judged surplus to B.C. Hydro's requirements, the site would be sold when the ROW is released. A heritage survey may be necessary as there is a large site nearby.

km 30-31 Gates River valley crossing (1km)

This short section would be used for 5L46 at the crossing of the highway, railway, and river south of D'Arcy. The objective would be to minimize the disturbance to the existing vegetation.

km 31-43 Gates River valley (12km)

This section of ROW would be released. It is all on private land except for about 2 km on the south shore of Gates Lake. The first portion of 4km is on the valley floor on poorly drained silty sandy soils that are on the edge of cultivated fields.
The objective would be to remove the line with the minimum impact on the adjacent farmland. As the soils are highly susceptible to rutting and compaction when wet, the towers would be removed from this section in dry weather, or when the ground is frozen. Existing bridges over the Gates River would be used, or a temporary bridge installed.

The second portion of 8 km is over a series of fluvial or colluvial deposits which are much better drained. The objective here would be to remove the line with the minimum of surface disturbance.

km 43-61 Birkenhead River valley (18km)

This section extends from Pemberton Pass to the edge of the Lillooet River flood plain. The ROW may be used for 5L46 in this section.

The ROW lies largely on the fluvial deposits of the Birkenhead River for 14km south to the Creekside Capacitor Station, it then crosses a rocky ridge for 4km. The objective here would be to maintain the vegetative cover on the ROW with a minimum of disturbance so as to ease future ROW maintenance and avoid siltation of the Birkenhead River. A temporary crossing of the Birkenhead River would be required to remove towers on the west side of the river.

km 61-78 Pemberton to Green River Station (17 km)

In this section the ROW would be released.

From km 61 to 64 the ROW is across private land in the Pemberton Valley and the Village of Pemberton. The objective would be the removal of the line with minimum disturbance to the land and land owners.

The agricultural land consists of silty sands prone to rutting when wet. Tower removal on the farm lands would be done when the ground is dry or frozen to minimize disturbance. Removal would be timed to follow the hay, or summer crop, season.

From km 64 to 65 the ROW traverses One Mile Lake Municipal Park along the edge of the highway. B.C. Hydro would consult with the Village of Pemberton to determine the treatment for the ROW.

From km 65 to 67 the ROW traverses land in the Provincial Forest and would be planted to Ministry of Forest's specifications.

From km 67 to 69 the ROW is adjacent to the south side of Highway 99 along the northern boundary of Nairn Falls Provincial Park. In this section the ROW would be left to regrow naturally, as requested by Ministry of Parks.

From km 69 to 78 the ROW is in the Provincial Forest and would be planted to Ministry of Forest's specification

km 78-89 Green River Station to Rainbow Substation

In this section the ROW would be used by 5L46 except for the short section along Green Lake from km 85 to km 87 which would be left for natural regrowth of trees to improve views.

From km 78 to 85 the objective would be to maintain the present vegetation cover with the minimum of disturbance.

From km 85 to 87 the ROW would be released. As this section is in the Provincial Forest the ROW would be planted to Ministry of Forest's specifications.

From km 87 to 89 the ROW would be used by 5L46. The objective would be to maintain the present vegetation cover with the minimum of disturbance.

South of Rainbow substation, the removal of 2L1 is still under review. The following description of removal is given in case the decision is made for removal. In this description, it is assumed that the Whistler and High Cheakamus routes would be used.

km 89-94 Rainbow Substation to Nita Lake

This section would be required for 5L46, and includes the sensitive wetlands at the north end of Alta Lake. As 2L1 is the centre of 3 lines, one of which (2L2) would be the active supply to Whistler at time of removal of 2L1, it is improbable for safety reasons that the four towers in the wetlands would be removed by helicopter.

It is proposed at this stage that each tower be accessed by a temporary road constructed of clean gravel over a geotextile base during the dormant season. The towers would then be dismantled using a crane. On completion, the gravel road and geotextile base could be removed.

km 94-96 Nita Lake to Miller Creek

From km 94 to 95 the ROW is in the Provincial Forest and the requirements of the Ministry of Forest would be met. Rapid reforestation of this section is desirable to reduce the visual impact of the unused ROW seen from Highway 99. Young trees would be fertilized.

km 96-98 Miller Creek to Function Junction

This section adjacent to the Whistler Industrial Area would be used for 5L46. Towers would be removed with minimum possible disturbance to ground cover.

km 98-109 Function Junction to Brandywine

From km 98 to 107 the ROW is within the Provincial Forest, within the Resort Municipality of Whistler, and adjacent to Highway 99. Removal of 2L1 would reduce visual impacts in this section. The reforestation requirements of the Ministry would be met.

From km 107 to 108.5 the ROW traverses Brandywine Falls Provincial Park. The objective would be the removal of the line with the minimum of disturbance to the vegetative cover of the ROW. As requested by the Ministry of Parks, efforts would be made to avoid damage to the young trees on the ROW and the ROW would be left for natural reforestation.

From km 108.5 to 109 the ROW is in the Provincial Forest Discussions and would be planted to Ministry of Forests' specification.

km 109-118 Brandywine to Cheakamus Canyon

In this section most of the ROW is on private land. The objective would be to retain the existing vegetative cover on the ROW with the minimum of disturbance. There are several small ponds and wetlands in this area as a result of perched water tables on the lava flows. These would be avoided in removal of 2L1. At Retta Lake one tower is on an island in the lake, the tower would be dismantled manually and removed by boat.

km 118-124 Cheakamus Canyon

This section of ROW is through the highly scenic Cheakamus Canyon. Where 2L1 is close to the highway for about 2km the objective would be to remove 2L1 with the minimum of disturbance, to retain visual quality. For the remainder, which is mainly over rock, the objective would be to remove 2L1 with minimum disturbance of the small trees that are managing to grow in this rocky area, and which feature in the views from the highway.

Portions remain of the old road through the canyon which was constructed to erect and service 2L1. As the road is now redundant, the culverts would be removed, natural drainage restored, and the road bed and cut banks seeded.

Although this length is in the Provincial Forest the site capability is very low due to the extensive rocky bluffs. This is one section of the ROW which would not merit planting with trees and indeed attempts to plant the ROW might adversely affect the scenic quality.

km 124-131 Lower Cheakamus River valley (7 km)

The objective would be to minimize disturbance of the dense low vegetation cover on the ROW. Any silvicultural treatment would depend on decision taken on future use of ROW.

km 131-137 Midnight Way to Cheekye (6 km)

The requirements of the owners with regard to restoration of the ROW would be met, subject to agreement giving equity between owners.

7.5 SOCIAL ISSUES

The removal of 2L1 would create a few opportunities for local employment in salvage work, site restoration, and planting of trees in areas to be returned to the Provincial Forest.

8.0 ENVIRONMENTAL MANAGEMENT PLAN FOR CONSTRUCTION AND OPERATION OF 5L46

8.1 GENERAL

This section has been prepared with the assumption that the generally favoured route, as identified in Section 6, and modified to include the Function and High Cheakamus routes will be approved by the regulatory authorities for this project, and that agreement will be achieved with the Indian Bands along the route for the necessary ROW. Where some options remain, as in the northern part and at Whistler separate management plans are described for each option.

Mitigative measures that B.C. Hydro will adopt to reduce environmental impacts of the project are described in this section. The plan has been arranged in sections to recognize the change of activity and authority as the project proceeds from design to operation.

8.2 DESIGN

The following general items will be addressed during the design phase to reduce environmental impacts.

(a) **Access System**

As the project is within an existing corridor with access roads developed in most sections to adjacent ROWs it is highly desirable from an environmental perspective to reduce the disturbance caused by development of further access roads.

B.C. Hydro will therefore, prepare an access plan for this project, which will determine how access is to be provided to the ROW and tower sites for the whole project. It will detail where helicopter access is to be used. Helicopter construction is presently recommended at the following locations on the 'generally favoured route' or alternates:

Pavilion Segment	- tower sites on north side of Bridge River
Gates Segment	- traverse of bluffs above Gates River
Pemberton Segment	- key towers on Signal Hill
Whistler Segment	- descent above Function Junction
High Cheakamus Segment	- crossing of Rubble Creek valley - head of Cheakamus Canyon - steep slopes near Swift Creek
Pavilion East Segment	- descent to Pavilion River
Bridge Segment	- descent to Applespring Creek - exposed towers along Bridge River

B.C. Hydro recognises that many adverse environmental impacts have been caused in the past by allowing contractors to construct access roads uncontrolled by the terms of any B.C. Hydro contract. For this project contracts will be designed to give B.C. Hydro better control of road construction methods and quality. Design will meet B.C. Hydro's road standards and environmental requirements. A heritage survey will be made of new access roads in areas of high heritage potential.

(b) **Clearing Design**

As soon as a centre line has been established, clearing and vegetation management experts will prepare a clearing plan designed to protect the transmission line and to achieve as rapid transition as possible to a stable ROW cover requiring the minimum of maintenance. The design will be based on existing and future land use, private landowner requests, existing and desired vegetation, terrain conditions, climate, and protection of aquatic, heritage, visual, or other resources. Site specific plans will be prepared for clearing, re-vegetation, and treatment of sensitive sites.

At sites with visual sensitivity, clearing width will take into account actual conductor height and structure location to reduce amount of clearing and resulting impact.

(c) **Selection of Conductor Formation**

B.C. Hydro is investigating the development of a new 'family' of towers referred to as the 'delta' type of towers (Figure 3) due to the configuration of the conductors. If this family of towers is adopted it is still possible to utilize the existing flat configuration towers where the extra height of the delta towers is undesirable.

Flat configuration has been identified as desirable at the following locations for aesthetic reasons:

- Fraser River crossing
- Bridge River crossing
- Pemberton Valley and Signal Hill
- through Whistler from Green Lake to sewage plant

A request has been received to use flat towers near Ivey Lake north of Pemberton. This is being reviewed. Delta configuration is considered advantageous along Anderson Lake, through Gates and Birkenhead valleys, in Green River valley, and south of sewage plant at Whistlers to reduce clearing width.

(d) **Selection of Finish for Conductors and Structures**

B.C. Hydro is reviewing the possible use of a 'dulled' finish on conductors to reduce their reflectivity and hence visibility. B.C. Hydro believes that there could be merit in use of conductors with such a finish from D'Arcy south to Cheekye, the most viewed portion of the line, and continues to investigate sources and costs for treated conductor.

The use of a 'dulled' finish on tower steel is also under review following requests made by individuals and the RMOW Council. B.C. Hydro had intended to draw from its stockpile of tower components for this project, particularly where flat conductor configuration is used. The possibility and cost of retractive treatment is being investigated, as is the cost of treatment of new tower components.

(e) **Heritage**

As soon as a centre line is established for the project on the ground the final heritage survey of sections of route not in existing 2L1 ROW will be done to conform to the requirements of the Heritage Conservation Act, and the design will take into account any findings.

(f) **Site Specific Issues**

The following site specific issues for environmental protection measures will be addressed during the final technical design of the project.

Kelly Creek

- On old Clinton IR2 locate tower off cultivated land.
- Ensure sites EgRk 7, 8, 9, and 10 are not adversely affected by tower location or access roads.

Diamond S Ranch

- Ensure that sites EfRk 32,34,35 and 44 are not adversely affected by tower location or access roads.
- Meet with owner to establish best location for towers, and tower type, in irrigated area.

Pavilion IR

- Locate crossover of 5L41, working to minimize visual impacts.
- Ensure sites EfRl 31 and 32 are not adversely affected by tower location or access roads.
- Prepare restoration plan for disturbed areas on existing ROW.
- Protect heritage site EfRl 32 at Fraser crossing.

Fraser Crossing (CE)

- Locate and design towers so that the crossing span matches the existing span in shape & elevation.

Westside Fraser

- Meet with owner of ALR lands to establish best location for towers and tower type in area with irrigation potential.
- Ensure heritage sites EfRl 19, 36, and 37 and EeRl 187 and 188 are not adversely affected by tower location or access roads.

Bridge River Crossing

- Determine extent of helicopter construction on north approach
- Locate and design towers so that crossing span matches the existing span in shape and elevation

Mission Ridge

- Study revegetation problems in sub-alpine area.
- Prepare restoration plan for damage on existing ROW.
- Ensure sites EfRl 133 and 186 are not adversely affected by tower location or access roads.

Seton Portage

- Locate crossover of 3L2 and 2L2 to minimize visual impact.
- Ensure access roads do not impact recorded heritage sites.

Anderson Lake

- Define best locations to reach 2L1 ROW from Highline road to limit environmental impact, discuss and agree with land owners.
- Determine and design any improvements to be made to Highline road.
- Ensure any ROW adjustments will not impact site EdRo 25 and historic site at DL4802. Protect site EdRo 23.

Gates River Valley

- Define section for helicopter construction.
- Review location near DL1250 to minimize visual impact and to determine safe tower sites near Eight Mile Creek.
- Ensure recorded heritage sites are avoided.

Birkenhead River Valley

- Review possible location for 5L46 on east side of valley and benefits accruing from removal of 2L1 from valley floor, expecially near Gramsons.
- If 2L1 ROW is used locate towers in areas of pasture to reduce interference with any cultivation.

Pemberton

- Undertake further study to determine whether to locate on east or west side of 5L42 across Pemberton Valley. In this consideration attention is necessary to visibility on Signal Hill and possible impact on campground in Nairn Falls Provincial Park, as well as impacts on land use in valley.

- Determine extent of helicopter use on Signal Hill to prevent scarring of ROW by road in a highly visible location.

Green River Valley

- Locate and design crossing of 5L42 to reduce visual impacts from the highway and to minimize intrusion into slide area.

Whistler

- Locate tower positions in wetlands and prepare a site specific access plan for each, including site restoration requirements.

- Select crossing site of Highway 99 at Function Junction to minimize visibility of line.

- Establish point for crossing 5L42 west of sewage plant with view of minimizing visual impacts.

- Recognizing potential future relocation of 5L42 and 2L2 away from west side of Alta Lake, establish location for 5L46 that will accommodate future location of these lines.

- Assuming future removal of 2L2 from Whistler to Brandywine for aesthetic reasons, establish a location for 5L46 in this section that would permit 2L2 to be relocated and keep visual impacts low.

High Cheakamus

- Study Rubble Creek crossing and determine a location and construction method that will retain aesthetic quality and meet MOP requirements.

- Determine alignment in canyon to minimize visibility from Highway.

- Determine locations for helicopter construction in Cheakamus canyon and on steep slopes south of Swift Creek to limit environmental impact of road construction.

East Pavilion

- Devise construction method to avoid need for an access road on steep slopes north of Highway 12.

- Determine alignment for crossing 5L41, 2L90, and 2L91 that is least visible from Highway.

Bridge

- Determine extent of helicopter construction required in east side of Applespring drainage and along Bridge River valley to achieve acceptable level of environmental impact.

- Determine location and geometry for Bridge River crossing to minimize visibility from road.

Seton

- Determine sites for crossing 5L42 to give minimum visual impact.

8.3 CONSTRUCTION

The environmental concerns to be addressed during the construction phase are shown in Tables 8-1 to 8-13. The distances shown correspond to construction on the route, described in Section 8-1.

In consideration of the proposed protection measures it should be recognised that B.C. Hydro has evolved some standard procedures for environmental issues typical of transmission line construction. These are described in B.C. Hydro's Manual for Environmental Inspection of Transmission Lines, which is under preparation. Some of the measures proposed in this section will be covered by the standard measures adopted, others will remain because they are very specific.

TABLE 8-1 ENVIRONMENTAL MANAGEMENT PLAN PAVILION PLATEAU: KM 0-15

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
TERRAIN	0-1.5	gravel & sand glaciofluval deposits	gullying and dry ravel on cutbanks	• reduce cutbank slopes and revegitate where erosion is occuring along existing access roads
	1.5-3.5	course textured colluvium with a high component of angular stones on extreme slopes	gullying, dry gravel on cutbanks	• use existing access roads, do not develop new roads other than spurs.
	4-6	steep sided creeks; stony course-textured	surface erosion and cutbank failure	• use existing roads, keep new access roads 10m moraine back from edge of banks to avoid erosion. Vegetation clearing to be kept to required minimum for vertical clearance to minimize bank erosion • use hand clearing where machine clearing would bring ground distrubance & erosion • reduce slopes of existing cut banks, recontour crests and revegetate
	8-15	Diamond S Ranch; rolling, medium to fine textured moraine	compaction, puddling, rutting and erosion along access roads in areas of fine textured soils	• gravel permanent access roads in depressions • restrict heavy vehicles to roads unless ground is very dry • use tracked vehicles off road • construct during dry soil period • cultivate to relieve compaction on disturbed areas beyond access roads • revegetate disturbed areas each construciton season
Agriculture	0-1	Irrigated hay field and grazing	loss of arable land	• locate towers outside irrigated field
	2-11	forested and open range	destruction of range vegetation during construciton; loss of grazing to new access roads and tower sites; soil compaction on access roads	• reseed for grazing
	11-14	Irrigated crop production	soil compaction and erosion on access roads; loss of arable land under towers	• cultivate compacted areas and reseed • construct after cropping during dry weather to reduce crop loss, soil compaction and general interference with ranch operations
			conflict with irrigation systems;	• locate towers to minimize conflict with irrigation (discuss location of towers with landowner)

TABLE 8-1 ENVIRONMENTAL MANAGEMENT PLAN PAVILION PLATEAU: KM 0-15

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
	14-15	forested range and improved pasture	destruction of range vegetation during forest clearing; loss of grazing on access roads;	• maximize use of existing access • cultivate all disturbed areas to relieve compaction and reseed
Forestry Vegetation	2-6	forest lands	erosion	• revegetate cutbanks & disturbed areas to control erosion and enhance grazing. Design vegetation management to provide a stable cover of mature browse.
Heritage	0.5	Site EgRK 7 (east of ROW)	disturbance from construction	• mark site, and avoid by using existing access. Monitor during construction.
	0.5	Site EgRK 8 (on ROW)	disturbance from construction	• mark site, avoid site by careful location of tower and access roads and hand clear.
	1.0	Sites EgRK 9 & 10	disturbance from construction	• mark sites and keep any access routes away from them, monitor during construction.
	8.0	Sites EfRK 32 (on ROW)	disturbance from tower or access road	• mark site, avoid with towers and access road, hand clear, monitor during construction.
	12-13	Sites EfRK 33	disturbance from tower or access road	• test tower sites for heritage material • mark site, avoid with access road, hand clear, monitor during construction
	12-13	Site EfRK 34 (on existing ROW)	disturbance from construction	• mark site, avoid site with access road, monitor during construction • test tower sites
		Site EfRK 35 (on access road)	disturbance during construction	• mark site, do not improve access road, monitor during construction

TABLE 8-2 ENVIRONMENTAL MANAGEMENT PLAN PAVILION RESERVE - FRASER RIVER CROSSING: KM 15-25

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	15-20	steep, medium to coarse textured moraine, rubbly colluvium and exposed bedrock	surface erosion, and sloughing on cutbanks	• use existing access, no extension of existing roads to lower canyon
	20-22	Fraser Crossing; exposed bedrock, gullied fluvioglacial terraces	rockfall, debris slides	• use existing access
Wildlife	21-22	Moran Flats bighorn sheep range on west side of Fraser	increased poaching along west side of Fraser if access is extended to lower portion of canyon	• no new access to be constructed into lower canyon on west side; existing roads to lower tower sites should be reclaimed if not required for line maintenance; if required, vehicle access should be restricted. No construction in period December to May
			habitat disturbance	• reclamation to be done in accordance with range and wildlife management objectives
Forestry/ Vegetation	15-20	parkland and grasslands	removal of vegetation resulting in soil erosion on steep slopes	• use existing access; reseed disturbed areas promptly after construction
				• restore disturbed areas of existing access roads on ROW, leave one road only
	22-23	mainly grasslands	damage at sensitive sites	• minimize ground surface disturbance; hand fell any trees that must be cut; reseed disturbed areas
Agriculture	15-25	forested range and open range	destruction of range vegetation	• pile and burn all slash after ROW clearing and reseed disturbed areas
				• reclaim any new access roads not required for line maintenance
Heritage	17	Site EfRl 31 partially	further disturbance	• test undisturbed portion of impacted area by existing site prior to construction; avoid tower location within site if possible; mark and monitor during construction
	19.5	Site EfRl 32 on bench above east side of Fraser	disturbance of site	• avoid site by locating tower above, adjacent to 5L42; use existing road access, do not extend road beyond present limit; mark and monitor during construction
	22-23	Sites EfRl 19,36,37	disturbance of sites	• avoid sites with access roads; use existing access, revisit sites and EfRl 45 during monitoring.

TABLE 8-3 ENVIRONMENTAL MANAGEMENT PLAN CAMELSFOOT RANGE - BRIDGE RIVER: KM 25-35

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	25-35	steep, gullied slopes of coarse to medium textured moraine, rubbly colluvium and talus	accelerations of existing erosion; slope failure on cutbanks, and slides related to road construction and clearing	• no extension of existing access roads • do not clear in gullies below vertical clearance requirements • reduce cutbank slopes on existing access roads and reseed
Forestry/ Vegetation	25-35	forest; some parkland	damage at many sensitive sites due to steep ground, high potential for soil erosion and slow revegetation	• do not clear in gullies below vertical clearance requirements • leave all low growing shrubs to maintain native ground cover • revegetate disturbed areas promptly
Visual	25-30	views of west side of Fraser Canyon from Highway 12	visual impact of clearing on steep, gullied terrain; 5L42 ROW has higher visual impact than necessary due to continuous clearing through deep gullies	• no extension of access roads • allow tree growth in gullies along 5L42 where clearance conditions permit • do not cut trees in gullies on new ROW below clearance requirements
	32 & 34	towers on exposed ridges	high visual impacts if roads developed	• use helicopters for tower construction
	34-35	Bridge River canyon - view from road, and from Highway 12	visual impact	• minimize clearing along ROW; span across river requires clearing only near tower sites • revegetate 5L42 ROW on west side from river up to bench at KM 35 to improve ROW appearance, and limit erosion
Heritage	29-31	Sites EeRl 187 & 188	disturbance as both sites are located within, or immediately adjacent to southeast side of 5L42	• whole plateau should be examined as construction proceeds; test tower sites and use existing access roads, monitor during construction
	35	historic site EeRl 186 on bench on south side of river	possible disturbance adjacent to 5L42, cabin was moved since 1984	• confirm removal of cabin • mark and protect any remnants at site; monitor during construction
	35	Sites EeRl 133	disturbance	• mark and protect site; use existing access road; monitor during construction

TABLE 8-4 ENVIRONMENTAL MANAGEMENT PLAN MISSION RIDGE: KM 35-49

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	38	rubbly colluvium and bedrock outcrops; debris slides	increased slide activity	• do not locate towers or roads at toe of slides
	40-41	steep, coarse texture morainal deposits on sides of deeply incised Moon Creek	gully erosion and slope failure caused by access road construction and scarification of ROW on steep slopes	• use existing access roads • limit clearing to that required for vertical clearance
	42.5-45	escarpment of loose rubbly colluvium, weak bedrock and debris flows	debris slides induced by road and tower construction	• avoid road and tower construction close to the rim of this escarpment
Forestry/ Vegetation	35-47	forest land	loss of medium and good growing sites;	• coordinate access with MOF to minimize loss of forest lands from new access roads
	38	sensitive site	disturbance of sensitive site on steep ground	• revegetate disturbed areas immediately
	40-40.5	forest land	disturbance of sensitive sites at crossing Moon Creek	• see "Terrain" prescription • revegetate disturbed areas with native shrubs
	46	forest land	disturbance of wetlands	• avoid crossing wetland area just north of route with access roads
	48-49	forest plantations	damage to plantations	• minimize disturbance in plantation; replant any disturbed areas outside ROW after consultation with MOF
	45-50	subalpine parkland	soil erosion on sensitive sites, steep slopes & wet meadows	• avoid disturbances of sensitive sites south of route by using existing roads • study, prior to construction, most effective way to revegetate disturbed areas

TABLE 8-5 ENVIRONMENTAL MANAGEMENT PLAN MISSION RIDGE - SETON PORTAGE KM 49-65

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	49-55	subalpine and alpine area; varying depths of coarse textured moraine and colluvium with some rock outcrops and cirques	soil erosion along existing access roads and ROW; rockfall	• use existing access • immediate revegetation of all disturbed areas using plants suitable for area • avoid travel off access roads • construct when ground is dry
	53-55	extremely steep moraine and colluvium deposits south of existing 5L42 ROW	debris slides induced by road and tower construction	• avoid road and tower construction close to rim of escarpment
	55-60	deep, medium to coarse textured moraine on steep slopes	erosion of cutbanks, minor slope failures	• use existing access roads • reduce cutbank slope, revegetate cut and fill slopes. Install adequate culverts
	60	rubbly colluvium and bedrock on steep slopes	rockfall along road cuts	• avoid
	60-65	rubbly coarse side, talus over bedrock on south side	slope failure and debris	• keep ROW immediately adjacent textured colluvium slides resulting from 5L42 at KM 60 to avoid over bedrock north access road extensions disturbance of escarpment and potential soil erosion • use existing access roads • revegetate roads if not necessary for line maintenance
	62-63	Whitecap Creek - steep gully	erosion and slope failure if steep slopes disturbed	• use existing access roads; do not extend into gully • span creek, keeping towers back from edge of gully on both sides of creek • clear only as necessary for vertical clearance.
Forestry/ Vegetation	49-53	subalpine parkland (alpine vegetation nearby)	disturbance of sensitive alpine and subalpine vegetation	• avoid areas of alpine vegetation to north of route at KM 49.5 and south of route at KM 50.5 • use existing access roads, no new access development
	53-55	sensitive soils on steep ground on both sides of proposed route	soil erosion from disturbance of sensitive sites	• construct foundations of towers only when ground is dry to reduce soil compaction, erosion and loss of sensitive alpine vegetation • revegetate all disturbed areas of 5L42 and new ROW after correction of any erosion problems
	53-60	forest land	erosion	• revegetate cutbanks and disturbed areas
	59.5	sensitive sites on steep ground on south side of route	soil erosion following disturbance of sensitive sites	• use existing access to tower sites, and revegetate access roads if not required for line maintenance • leave trees to minimize erosion on steep slopes where possible

TABLE 8-5 ENVIRONMENTAL MANAGEMENT PLAN MISSION RIDGE - SETON PORTAGE KM 49-65

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
	60-65	productive forest lands	soil erosion on steep slopes from disturbance of sensitive sites at KM 60-61.5 & 62-62.5	• revegetate cutbanks and disturbed areas with grass-legume mixes • leave trees along east side of new ROW for slope stability and aesthetics
Recreation	53-55	UREP Reserve (Recreation reserve on Mission Mountain)	aesthetic impact of wider clearing, additional line across VREP Reserve	• minimize impact on alpine vegetation through use of existing access only, correction of erosion problems, revegetation and careful cleanup • see Forestry/Vegetation comments for revegetation
Water Quality	52-55	Ptilla, Ohin and Tsee Creeks; licensed water supplies	deterioration of water quality	• ensure no waste discharge to south of ridge line, revegetate disturbed areas • clear to maintain stumps and all low growing vegetation.
	58	Omin Brook - licensed	deterioration of water quality	• ensure no waste discharge to south of ridge line, revegetate disturbed areas • clear to maintain stumps and all low growing vegetation.
	62-63	Whitecap Creek	deterioration of water quality	• see Terrain comments, ensure no waste discharges in gully • clear to maintain stumps and all low growing vegetation

TABLE 8-6 ENVIRONMENTAL MANAGEMENT PLAN ANDERSON LAKE: KM 65-89

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	65-89	Creek fans between km 65 and 85 are usually steep with coarse textured bouldery alluvial deposits	erosion and channel changes during floods	• span creek fans where possible • do not disturb creek channel on fan
	65-75	very steep slopes, unstable gullied medium textured moraine & fluvio-glacial deposits and colluvium over bedrock. Area of very high potential impact	slope failure erosion and minor debris slides on access roads	• revegetate all cutbanks and ensure roads are properly culverted with little drainage concentration
	83-84	talus and debris slides	accelerated rockfall	• do not construct access roads across talus & debris slide areas; careful tower location necessary
Forestry/ Vegetation	65-85	forest land; sensitive sites below 2L1 ROW on steep slopes. Areas of concerns are at KM 74-75.5, 76.5; and 82 at mouth of Scutt Creek	soil erosion from disturbance of sensitive sites	• avoid clearing of sensitive sites in and along creek gullies, confine activities to existing ROW; use existing access roads to tower sites, and revegetate after construction
			increased fire hazard from additional clearing along ROW; disposal of slash; blowdown.	• dispose of slash according to MOF requirements
				• retain wind firm forest edge on uphill side of ROW, make any ROW adjustments on downhill side
Settlement and Water Quality	65-85	scattered homes along lake, many dependent on small streams or wells adjacent to ROW or downslope of it	disturbance of wells from blasting for tower installation; siltation of surface water sources	• identify and locate all domestic water supplies, surface and wells. Inspect condition of works (intakes, wells, pipes), record and retain for future reference to determine degree of impact, if any. Avoid blasting near wells; if damage occurs, remedy; sample water prior to clearing to determine quality
	65-85	Water supplies	deterioration of water quality	• retain vegetation along all small water courses; use culverts if roads cross a licensed stream; retain existing vegetation to greatest extent possible; revegetate disturbed areas with grasses and permit native shrubs to invade so that future use of herbicides will be minimized
	65-85	Highline road	erosion	• reduce cutbank slopes and revegetate where necessary • correct any drainage problems
	76-77	McGillivray Creek licensed, intake below 2L1 ROW	deterioration of water quality	• retain riparian vegetation; do not cross creek with access road or vehicles; ensure no wastes discharged to stream; design drainage on roads to run away from creek
	84	D'Arcy Community Water Supply	deterioration of water quality as intake adjacent to 2L1 ROW and road	• as for McGillivray Creek, and ensure drainage from road is directed downstream of intake

TABLE 8-6 ENVIRONMENTAL MANAGEMENT PLAN ANDERSON LAKE: KM 65-89

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Agriculture	66 & 85	improved pasture and orchard adjacent ROW	damage by access roads	• route roads away from cultivated areas
Heritage	65	Sites EeRn 9,10,17,18, and 19 (off ROW)	disturbance of sites	• confirm locations • mark and protect sites if access roads near them are used.
	76-77	Sites EdRo 23 & 24 on 2L1 ROW at McGillivray Creek	disturbance of sites	• Site on north side of McGillivray Creek cannot be avoided, therefore make evaluation; other site on south side of creek can be spanned; use existing access; do not increase ROW on east side.
	78	Site EdRo 25	disturbance of site	• avoid extension of clearing on downhill side of ROW; mark and protect site during construction; monitor • use existing access only
	81	significant heritage site adjacent to and within 2L1 ROW (L4802)	disturbance of site	• span old orchard; • no new access road construction • hand clear on west side of 2L1 ROW • monitor during construction
Wildlife	73-83	strips of trees between ROWs	reduction in cover for wildlife	• retain strips of trees along uphill side of 2L1 ROW, to extent line security permits. Where ROW adjustment is required adjust on downhill side

TABLE 8-7 ENVIRONMENTAL MANAGEMENT PLAN GATES VALLEY: KM 85-100

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	87-89	fine textured soils	erosion	• locate access roads carefully and revegetate cutbanks
	90-96	extremely steep sloping bedrock outcrops with high component of coarse textured colluvium and blocky talus deposits	visual impacts	• use helicopter erection and hand clearing; leave trees below vertical clearance requirements in gullies
	96-97	bouldery, coarse textured fan of Eight Mile Creek	increased channel erosion and tower loss	• debris flow potential, protect tower sites • use existing access
	98-99	large avalanche track crosses ROW	loss of towers and subsequent impact of repair under adverse conditions	• span track
Forestry/ Vegetation	85-104	vegetation cover on new ROW	erosion	• revegetate disturbed areas and adopt vegetation management plan that minimizes use of herbicides
	85.5	immature Douglas fir - ponderosa pine forest	soil erosion following disturbance of vegetation on steep terrain	• avoid sensitive area by keeping alignment as far west as possible, close to 3L2 line
	85-90	mature and immature coniferous forest	fire	• fire prevention important because of dry climate and adjacent settlement, slash disposal to be done according to MOF requirements
	90-96	mature and advanced immature coniferous	loss of vegetative cover loss of productive forest	• fire protection important, slash disposal according to forests, poor site, land MOF requirements
		some sensitive sites (refer to terrain)		• minimize clearing, do not clear in depressions below vertical clearance requirements
Settlement Land Use	96-97	private lot	disturbance during construction	• use existing access road for 5L42
Water Quality	85-100	Gates Creek	deterioration of water quality	• see Fisheries comments
Fisheries	85-100	Gates Creek important salmon rearing and spawning habitat and supplies artificial spawning channels at D'Arcy. Gates Lake stocked with rainbow trout; also used by Kokanee and Dolly Varden	deterioration of water quality; siltation of spawning habitat	• do not clear stream bank vegetation • revegetate new ROW where disturbed promptly • hand clear ROW from KM 90 to 96
Visual	90	crossing of road	visual change	• retain screen of low shrubs along each side of road at crossing
	90-96	new ROW	visual change	• do not clear on bluffs, talus slopes and in gullies below vertical clearance requirements.

TABLE 8-8 ENVIRONMENTAL MANAGEMENT PLAN GATES VALLEY: KM 85-100

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	103	avalanche tracks extend close to 2L1 ROW	damage or loss of towers	• maintain forest buffer between avalanche run out zone and west side of ROW
	105-108	gravelly, coarse textured floodplain	increased bank scouring	• span channels; no disturbance of river banks by access roads
	110.5-112.5	talus deposit	debris slide	• avoid disturbance of toe
Forestry/ Vegetation	103-116	vegetation cover on ROW	deterioration of water quality	• retain maximum amount of existing ground cover; revegetate disturbed areas
	105	forest land	increased hazard from avalanche	• use existing access road and avoid additional ROW clearing on east side of 2L1 ROW
Settlement Land Use	103-106	scattered rural settlement, area has moderate to good development potential	visual impact	• minimize additional clearing; confine activities to existing ROW
	103-106	domestic water supplies licensed on small creeks and Birkenhead River	deterioration of water quality	• enhance growth of native shrubs on disturbed areas except for cleared land, and adopt vegetation management plan that minimizes use of herbicides
	113.5	Lokla Indian Reserve	visual change	• confine activities to existing ROW; minimize clearing adjacent to highway
Agriculture	102-104	Improved pastures	soil compaction on access roads	• cultivate to relieve compaction and reseed
Visual/ Recreation	104-105	proximity of 2L1 ROW to road and settlement in tight, congested valley	visual impact	• minimize tree clearing along ROW in these sections to retain existing visual screen
	108-112	proximity of line to road and river	visual impact	• prompt clean up of ROW, revegetate disturbed areas. Adopt vegetation management plan that enhances growth of native shrubs
	115-117	UREP Reserve with MOF Recreation site at mouth of Owl Creek	visual impact	• minimize any additional clearing of trees along 2L1 ROW to retain as much visual screening of line as possible
Heritage	115	Sites EcRq 11,12,13	disturbance	• sites have not been located, confirm locations, mark, and monitor if necessary
Fisheries	103-116	Birkenhead River - productive river and important native fishery	deterioration of water quality	• restrict activity to existing roads and 2L1 ROW; use bridge to cross fishery at Birkenhead River; use culverts for crossing of minor streams; retain riparian vegetation along Birkenhead River

TABLE 8-9 ENVIRONMENTAL MANAGEMENT PLAN LILLOOET - GREEN RIVER VALLEYS: KM 116-142

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	120-122	Lillooet River floodplain; silty, sandy fluvial deposits and sediments	compaction, puddling and rutting along access roads	• construct during dry late summer period • cultivate to relieve compaction
	123-125	Signal Hill; steep exposed bedrock and shallow coarse colluvium	increased rockfall along access roads	• use existing road access; do not extend access down south side of hill, north of Green River
	125-132	steep sidehills	ravelling of cutbanks along new roads	• use existing logging roads as much as possible
	134-135	Green River Slide	disturbance of unusual geological feature	• do not construct road on debris, if possible locate only one tower on slide; place tower by helicopter
	140-142	bedrock dominated slopes, rubbly colluvium and talus	increased rockfall along access roads	• use existing access; confine activities to existing ROW
Forestry/ Vegetation	116-120	mature forest northwest of existing lines	interference with forestry operations	• coordinate plans, and operations with MOF licensees; confine activities to ROW
			soil erosion on cutbanks or other disturbed areas	• revegetate disturbed areas
	123-125	stands of mature forests adjacent to existing lines	loss of tree screen	• use existing access along 5L42 to reduce impact
	127.5	forest plantation	loss of plantation	• minimize loss in plantation by keeping activity within ROW; use existing access roads; replant disturbed areas outside ROW
	135.5	forest plantation	loss of plantation outside ROW	• use existing access; replant disturbed areas
	142	forest land; small area of wetland	disturbance of sensitive wetland vegetation	• do not construct access roads across wetland located east of 2L1 ROW
Agriculture	120.5-122.5	improved pasture, non-irrigated forage and undeveloped arable land	soil compaction along access routes	• cultivate to relieve compaction and reseed
			loss or arable land	• use free-standing towers on farm land • locate towers to minimize interference with future cultivation, match with 5L42 towers where possible
Visual	120-122.5	Lillooet Valley crossing; distant views of line from Pemberton and Highway 99	visual impact of new line and ROW clearing	• minimize clearing; if possible set towers well back from road at crossings and create vegetation screen adjacent to road • match tower spacing with 5L42 where possible

TABLE 8-9 ENVIRONMENTAL MANAGEMENT PLAN LILLOOET - GREEN RIVER VALLEYS: KM 116-142

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
	122.5-125.5	Signal Hill	new clearing on north of Pemberton	• use existing access road on slope of Signal Hill north side of Signal Hill; will be visible from there only to extent necessary. Use helicopter to avoid extension of access roads in ROW
	125.5	Green River Crossing at Nairn Falls Park	visual impact from clearing adjacent to river and across park	• do not clear down to river; no access to be developed on north side of river; helicopter construction may be necessary. Maintain vegetation screen between line and campsite.
	129-132	hillside to east of Highway 99	visual impact of clearing on ROW descending slopes to Highway 99	• use existing access wherever feasible; at road crossing locate towers back from road. Vegetation buffer should be retained at crossing, or planted adjacent to road to screen towers and ROW in foreground
	139-141	view of line from Highway 99 on approach to Whistler from the north	visual impact of additional clearing which exposes line to view from Highway	• leave existing buffer strip of vegetation to screen line from road; protect riparian vegetation along Green River • plant shrubs along top of bank adjacent to road to provide screen, if necessary.

TABLE 8-10 ENVIRONMENTAL MANAGEMENT PLAN WHISTLER - (GREEN LAKE TO ALTA LAKE): KM 142-149

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	146-148	shallow organic fen, sandy floodplain deposits	compaction of organic deposits and disruption of drainage	• all access roads in wetlands to be removed, use clean gravel on geotextile base
Vegetation	146-148	wetlands	loss of vegetation	• replant disturbed areas with wetland species • construct in dormant season
Visual	142-146	views of Green Lake and mountains from west	visual impact	• use flat conduction formation • create irregular boundary for ROW; retain any screening trees on northwest side; consult with Municipality
	146	Highway Crossing	visual impact	• plant screen of low shrubs on ROW on either side of Highway 99: use flat conductor formation
	146-148	views over wetlands	visual impact	• use flat conductor formation • use similar structures to 5L42. Match step towers with 5L42 where possible
	149	homes	visual impact	• retain screen of trees at angle; revegetate ROW promptly after clearing
Wildlife	146-148	wetlands	disturbance	• construct outside nesting season May through July

TABLE 8-11 ENVIRONMENTAL MANAGEMENT PLAN WHISTLER - (ALTA LAKE TO CHEEKYE): KM 149-194

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	153-154	steep colluvial and fluvial deposits	erosion	• no new access road, revegetate disturbed areas on 2L1 ROW.
	156-160	columnar basalt flows and talus complexed with coarse textured moraine	increased rockfall on basalt cliffs	• avoid access road construction across talus, avoid basalt cliffs
	171-172	shallow soil over steep bedrock	erosion	• no new access roads, use helicopter • revegetate promptly after clearing
	172	Rubble Creek	loss of tower	• set towers off flow path
	187-188	steep colluvial slope	erosion	• no new access road
	193	Cheekye Creek	debris flow	• keep towers on rock knobs
Vegetation	149-157	vegetation cover on ROW	visual impact	• minimize disturbance on ROW; revegetate promptly; maintain drainage
	155	riparian vegetation	erosion	• retain low riparian vegetation at Cheakamus River
	156-169	forestry	loss of productive forest land	• locate in cut blocks where available; use existing roads
Visual	150-152	ROW appearance	visual impact	• no access roads on ROW slope above Miller Creek • restore slope exposed to views from Highway immediately after construction • replant abandoned 2L1 ROW on slope above Miller Creek with conifers and fertilize
	155	Highway crossing	visual impact	• locate towers back from banks
	171-172	Descent to Rubble Creek	visual impact	• no access roads on steep slope, use helicopter • locate crossing in cooperation with MOP
	172	Rubble Creek	visual impact	• set towers back from park access road; revegetate ROW promptly
	187-188	steep exposed slop	visual impact	• no road construction on slope
	192	Highway crossing	visual impact	• keep span high close to 5L42

TABLE 8-12 ENVIRONMENTAL PROTECTION PLAN CHEAKAMUS RIVER CANYON: KM 164-179

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	164 171	basalt ridges, lakes and wetlands	terrain disturbance	• minimize new road construction
	171 173	gravelly, coarse textured floodplain	bank scouring during peak flows	• span channels, no disturbance of river banks
	173-175	steep ascent	terrain disturbance	• use helicopter construction and hand clearing
	175-179	rock formations	terrain disturbance	• use helicopter construction and hand clearing
Vegetation	166-179	vegetation cover	aesthetic concerns	• adopt a vegetation management plan that minimizes use of herbicides
Visual/ Recreation	166-168	proximity of line to highway and Pinecrest, and Black Tusk Village	increased exposure of line if additional clearing removes existing screening	• use flat conductor formation • minimize clearing adjacent to highway and subdivisions to reduce exposure of line. Plant shrubs off ROW at edge of highway to create screen
	168-179	Stanley Lake Recreation area: views of Cloudburst Mountain	towers and conductors may be skylined against views of Cloudburst when travelling south on highway	• use flat conductor formation • locate tower on south side of inlet to Shadow/Stanley Lakes far enough south so that it is not skylined against mountains when viewed from highway. Retain vegetation buffer along west side of Stanley Lake to screen line from recreation area
	173-175	view or ROW	aesthetics	• use irregular boundary to ROW • limit clearing at base of slope to that necessary for clearing
	175-179	views of Tantalus Range	aesthetics	• use irregular boundary to ROW • limit clearing at base of slope to that necessary for clearing • retain as many stunted trees on ROW as possible in rocky areas
Settlement	166-168	Pinecrest Estates; Black Tusk Village	primarily a visual impact depending on extent of additional clearing along 2L1 ROW	• see "visual" prescription above. New line will lie east of 2L2 line: visual impacts are difficult to avoid as existing clearing along 2L2 exposes the new line to these subdivisions. Use existing access and confine activities to existing ROW
	176	Butterfly Lake Cabins	aesthetics	• screen line from lake behind rock ridge • Do not link lake access road to ROW
Water Duality	166-172	Small lakes	contamination of small lakes used for domestic water supply and swimming (Pinecrest, Stanley, Lucille etc.)	• as for vegitation • reduce surface errosion by careful choice of clearing techniques

TABLE 8-13 EAST PAVILLION kM 0 -11

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	1-2	steep medium to coarse textured moraine	surface erosion, sloughing on cutbanks	• do not construct access road on exposed slope
	3	Pavilion flow slide	movement of tower, disturbance of unusual geological feature	• span slide
	6.5-7.5	steep medium to coarse textured moraine	surface erosion, sloughing of cutbanks	• minimise surface disturbance; revegetate promptly
	8.5-9.5	Fraser Crossing; exposed bedrock, gullied glaciofluvial terraces	rockfall, debris slides	• do not construct road access down slopes into canyon
Wildlife	8.5-9.5	Moran Flats bighorn sheep range	increased hunting if road access extended	• do not construct road access down slope into canyon
Forestry/ Vegitation	1-2 6.5-7.5 8.5-9.5	sensitive dry sites	surface erosion	• minimise surface disturbance, revegetate promptly
Agriculture	2.0-2.5	irrigated field	interference	• keep tower off field
	7.5-8.5	irrigated fields	interference with irrigation systems	• locate towers on field boundaries
	7.5-8.5	ALR lands	soil compaction, crop loss	• construct when soil dry after hay harvest
	9.5-11.0			• relieve any compaction by cultivation and reseeding
Visual	2	Highway crossing	visual impact	• keep towers back from highway
	7-8	crossing of 5L42, 2L90 & 2L91	visual impact	• select crossing site carefully to minimize visibility from Highway
Heritage	2-3	sites EfRk 6, 30, 41 & 42	disturbance by ancillary development and/or access	• confirm location, mark and protect sites. Span valley bottom if possible

TABLE 8-14 ENVIRONMENTAL MANAGEMENT PLAN BRIDGE & PART OF ANTOINE: KM 0-28

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
Terrain	5.5-8.0	steep gullied slopes, exposed bedrock & colluvium	slope instability, erosion	• do not construct roads
	10.5-13.5 16.0-16.5	steep slopes, gullied and failing colluvium mantle	slope instability, erosion	• revegetate disturbed sites promptly • do not switchback roads within ROW • revegetate disturbed sites promptly
Wildlife	4-8 10-8	deer range	increased hunting due to improved access	• no road should remain along ROW after construction
	25-28	Mountain goats in Bridge River canyon	increased hunting due to improved access	• recontour & reseed all roads that extend access closer to canyon than present
Vegetation	9-18	dry park land sensitive site on steep slopes	degradation of vegetation due to erosion and sloughing	• any road to be recontoured and seeded after use
Visual	0-1	ascent from node F	visual impact	• locate carefully to minimise visibility from Highway 12
	7.5-8.5	steep slope	visual impact	• do not construct roads
	9.0-12.0	steep slopes highly exposed	visual impact	• use roads only on slopes not seen from road • do not switch back roads within ROW
	12-18	long traverse of steep slopes	visual impact	• do not construct road along full length of ROW • locate access roads to ROW so as to minimise visibility from road • all roads to be recontoured and seeded after use • use helicopters where visual impact of access roads would be severe
Water	1	Blackhill Creek	all licensed streams	• install culvert or bridge • do not cross with road
	8.5	Applespring Creek		• do not cross with road
	18.5	Antoine Creek		
Heritage	18-19	High heritage potential	disturbance	• survey area, mark & protect and sites

TABLE 8-15 ENVIRONMENTAL MANAGEMENT PLAN SETON IR 5A AND LOKLA IR 4

RESOURCE	LOCATION (KMP)	FEATURE	POTENTIAL IMPACT	PROTECTION MEASURE
SETON IR 5A				
Terrain	2-3.5	steep slopes, colluvium apron	erosion stability	• restore natural drainage across roads, recontour and reseed
	3.5-4.5	Whitecap Creek gully	instability	• do not extend roads into gully
Visual	0 0.5	crossing of 5L42	visual impact	• select sites to minimize visibility from settled area
LOKLA IR 4				
Visual	0-1	proximity to road	visual impact	• select locations for angle towers to give best screening from road
Heritage	1	high potential at river crossing	disturbance	• survey area, mark & protect sites

8.4 CONSTRUCTION ON OTHER ROUTE OPTIONS

The environmental management plan for other route options is included in Tables 8-12 to 8-14. No plan has been prepared for the option at D'Arcy as representatives of the Anderson Lake Indian Band have agreed to negotiate a ROW for the generally favoured route.

8.5 TRANSFER OF PROJECT TO PRODUCTION GROUP

It is recognized that much data accumulated during the study of this project will be of use to those in the Production Group of B.C. Hydro responsible for operating and maintaining the new line, and maintaining the ROW. It is also recognized that many of the restorative measures undertaken during construction will need to be monitored for some time after construction is finished.

At the time of transfer to the Production Group a project manual will be prepared and given to the Production Group, who have been represented on the project team. Information included therein will be:

(1) Environmental commitments made by B.C. Hydro in approval and construction phases.

(2) Environmental conditions established by regulatory authority.

(3) A record from Properties Division of all land owners on ROW and any commitments made to them during project.

(4) Location of all sites where restorative measures are underway, with a report on measures taken, progress made, and any necessary future action required.

(5) Heritage site locations, located by distance from structures.

(6) Water intake locations on, or below, ROW, tied into structures. Location of any pipelines crossing ROW.

(7) Record of correspondence regarding future of Highline and Cheakamus valley roads.

After completion of construction and transfer of the project manual it will be the responsibility of the Production Group to meet the commitments made by B.C. Hydro and to complete any longterm restoration measures still in progress.

9.0 OTHER CONSIDERATIONS

9.1 GENERAL

This section deals with issues brought forward by the public, or consultants, that are not part of the environmental design for the project.

9.2 ISSUES IDENTIFIED BY THE ENVIRONMENTAL CONSULTANTS

The following issues have been identified that are not dealt with elsewhere in this report and that require response from B.C. Hydro. They include a number of measures suggested to mitigate against, or compensate for, impacts which may be incurred as a result of the project. In addition, measures aimed at maximizing potential local benefits are identified. They are worded as received by B.C. Hydro.

(a) **Contracting Policy (Socio-Economic Consultant)**

B.C. Hydro should structure contracts so that smaller, local contractors will be capable of bidding on projects. The objective of this measure is to maximize potential opportunities for and involvement of the regional labour force and contractors. This will be particularly applicable during the first two to three years of construction, during logging and clearing activities, construction of tower foundations, and possibly involvement in dismantling the 2L1 line.

B.C. Hydro Response

B. C. Hydro structures work which can be handled by local contractors, such as clearing, into smaller units.

(b) **Opportunities for Indian Bands During Construction (Socio-Economic Consultant)**

The Indian Bands consulted all expressed interest in participating in the construction of the project in order to generate employment for Band members as well as developing new job skills. B.C. Hydro should work toward developing a more creative and effective approach to ensuring that these opportunities are in fact realized. Past attempts at involvement of the native community in B.C. Hydro projects have apparently not been effective, thereby contributing to the cynicism expressed by them toward B.C. Hydro.

Allowing Indian Band companies to bid on projects on a competitive basis with all other contracting firms would not likely be effective in the long run. Experience has shown that the native companies often lack the experience and sophistication to prepare competitive bids, and then to follow through with performing the required activities as specified in the contract on time and on budget. This is likely to lead to frustration on the part of all parties concerned.

A more creative and likely more effective approach would be for B.C. Hydro to initiate consultations with individual Indian Bands with the following objectives in mind:

(1) to confirm the Band's interest in participation in construction;

(2) to assess their availability of manpower resources, including skilled and unskilled labour and construction management capability;

(3) to precisely define which aspects of construction they are capable of undertaking;

(4) to negotiate a contract (or series of contracts) between B.C. Hydro and the Band (or Band company) for a specified piece of work. The contract may require special provisions in recognition of the unique circumstances associated with this approach (eg: project management provisions, monitoring of performance and scheduling, etc.);

(5) to identify job opportunities with other non-native contractors working on the project. B.C. Hydro's representatives in these consultations should have demonstrated experience and effectiveness in working with Indian Bands, and should have a commitment to designing and following through with solutions which will be of mutual benefit both to the native community and to B.C. Hydro.

B.C. Hydro Response

B.C. Hydro is developing experience in engaging native contractors both for maintenance of ROW and for clearing. From this experience B.C. Hydro recognizes that where inexperienced native contractors are involved there has to be a greater level of assistance and supervision supplied by B.C. Hydro.

B.C. Hydro recognizes the desire of some of the Indian Bands in the project area to participate in construction of the project, and anticipate this will be a matter for discussion in the negotiation yet to be undertaken with the Bands.

(c) **Accommodation (Socio-Economic Consultant)**

The availability of accommodation may well be limited, particularly if current trends of very low vacancy rates during the summer months persist due to high levels of economic activity (eg: tourism/recreation, other construction projects). Offsetting this short supply may be a market response resulting in additional accommodation facilities. For instance, a new 40-50 unit motel is planned for Pemberton, and other facilities are planned for Britannia, south of Squamish.

Nevertheless, there would likely be a serious shortage of accommodation in more remote areas such as Seton Portage/Shalath, and shortages in other areas should also be anticipated. These shortages will likely be most apparent for affordable motel accommodations, and for facilities to serve recreation vehicles and campers. With respect to the latter, it is important that planning be undertaken to ensure that recreation vehicles

are not scattered throughout the study area in a haphazard fashion.

Suggested measures to deal with anticipated shortages include:

(1)) Undertake a detailed assessment of required accommodations in principal activity centres throughout the study area. This assessment should include estimates of numbers of accommodation units needed, the timing of demand, types of meal preparation and other factors;

(2) If a market response is anticipated, work with private sector operators and local government to ensure that they are apprised of the demand for accommodations arising as a result of this project; and the timing of the need;

(3) Consult further with local governments and Indian Bands to identify potential sites for recreation vehicle parks or similar facilities and to outline preparation, maintenance and reclamation procedures for such sites.

B.C.Hydro Response

B.C. Hydro has considerable work experience in the project area and recognizes the shortage of accommodation in the northern part of the study area.

For the limited size of work crews involved, B.C. Hydro will rely on market accommodation for its own staff south of Pemberton. It is the option of contractors to do as they please, but it is presumed they would take a similar course.

Whichever route is selected north of Pemberton there would be a shortage of accommodation. B.C. Hydro recognises there would be a need for a construction camp at either Shalalth or near Duffey Lake, depending on route selected. As contractors would change year by year B.C. Hydro is considering the most appropriate manner of providing accommodation.

(d) **Transportation (Socio-Economic Consultant)**

No significant negative impacts are expected to result from the transportation of construction equipment, materials and crews through those portions of the study area serviced by hard-surfaced roads. In order to ensure that these impacts are minimized, the following steps should be taken:

* utilize the ROW for movement of equipment wherever possible; and

* where this is not possible, move equipment to and from work sites with low-bed tractor/trailer units.

More pronounced impacts are expected in those portions of the study area which are serviced by gravelled roads. There impacts will result primarily from dust and noise generated by construction traffic. B.C. Hydro should work with its contractors and the Ministry of Transportation and Highways to ensure that appropriate dust suppression measures are taken. In addition, the comment made regarding the use of the ROW for movement of equipment to the greatest practical extent is also applicable here.

B.C. Hydro Response

B.C. Hydro is developing an access road plan for construction of the project. As access cannot be continuous along the ROW due to terrain, and rivers, several shifts of heavy equipment on public roads would be necessary. B.C. Hydro will work with the contractor to reduce congestion caused by such shifts. B.C. Hydro is aware of the desirability of maintaining traffic flow on Highway 99.

The main lengths of public gravelled road that may be affected are the Bridge River/Gold Bridge road, Mission Pass Road, and the partially paved road through Seton Portage and Shalalth. Where there is settlement B.C. Hydro will work with Ministry of Highways to suppress dust.

(e) **Reconsider Tax Exempt Status of Transmission Lines (Socio-Economic Consultant)**

There is considerable legitimacy in the claim by local residents and local government representatives that the region through which the transmission lines pass incur significant disbenefits, with little if any benefits in return. This is considered inequitable and the more vociferous proponents of this view point argue that it is another example of the exploitation of the Province's hinterland areas for the benefit of the heavily populated Lower Mainland.

A possible approach to redressing this issue in a straightforward and effective manner would be the removal of the tax exempt status of transmission lines on ROW provided by easements for local government purposes. Such a measure would generate significant and tangible financial benefits to the region on an ongoing basis. The local government agencies consulted indicated that with an additional committed flow of funds, they would be able to provide additional needed services presently not affordable, including community recreation facilities, tourism facilities such as community camp grounds, and enhancement and upgrading of the natural environment (e.g. improvements to One Mile Lake in Pemberton).

B.C. Hydro should take steps to evaluate the feasibility and implications of this recommendation including:

(1) evaluation of policy implications from B.C. Hydro's perspective, taking into account recent changes whereby Hydro now provides compensation to local governments for dams, reservoirs and generating facilities;

(2) consultation with Ministry of Municipal Affairs (Deputy Minister and Policy & Research Branch) regarding the policy implications from the Province's perspective;

(3) consultation with Union of B.C. Municipalities; UBCM is actively involved jointly with the Ministry of Municipal Affairs in evaluating present local government finance issues and advancing recommendations for improvements to the system;

(4) determination of financial implications, from the perspective of B.C. Hydro as taxpayer and the local government as recipients of the funds;

(5) identification and evaluation of optional approaches to putting into effect a system of compensation to local government (e.g. simple removal of exempt status, other methods such as grants in lieu of taxes in accordance with payment formula).

B.C. Hydro Response

B.C. Hydro pays taxes where it owns ROW in fee, this favours securing ROW through easements. To date B.C. Hydro has not paid taxation on transmission lines on easements other than the 1% of revenue that B.C. Hydro pays to Municipalities, and to the B.C. Government on behalf of rural area as grant in lieu of taxes. This money is distributed to regional districts by the B.C. Government. In addition, B.C. Hydro pays school taxes on transmission lines with the payment going to the B.C. Government. B.C. Hydro does not pay taxes unless so instructed by the provincial government, or BCUC. The property owners pay taxes on their property with the ROW easement on it.

(f) **Compensation to Indian Bands (Socio-economic Consultant)**

Although the issue of compensation to Indian Bands is not directly related to the land use and socio-economic component of the environmental studies, it is an issue that was raised in the meetings with the Bands consulted. The Bands are of the view that the past methods of compensation negotiated on their behalf by the Federal Department of Indian and Northern Affairs are inadequate and do not reflect the value to the Bands of the lands affected or the extent of the disbenefits which they have incurred over the years as a result of B.C. Hydro's activities. This is particularly pronounced in a community such as Seton Lake/Shalath where Band lands and the Indian community have been heavily impacted by B.C. Hydro's presence.

It is not within the scope of this report to make specific recommendations concerning compensation to Indian Bands. However, general suggestions for consideration include the following:

(1) reconsideration of basis for establishing the value of land alienated for rights-of-way. For instance, the market value of comparable rugged grazing land in the Province's interior is very low (e.g. $100 - $200 per acre). The cash value of compensation based on this method of assessment is therefore very low;

(2) compensation package should include an ongoing contribution, similar to the property tax concept identified above for local governments;

(3) B.C. Hydro should be willing to consider and evaluate requests for electrical service on Band lands for developments not directly related to the transmission line projects. For instance, the Seton Lake Band and the Anderson Lake Band identified specific service requirements needed either for residential development or economic development initiatives.

B.C. Hydro Response

B.C. Hydro anticipates that terms of compensation for ROW will be a major item in the anticipated negotiations with the Indian Bands.

Service is made available to Indian Bands on the same terms as other local residents. Where a specialized service is required for industrial purposes, such as a 3 phase supply for a sawmill at D'Arcy, B.C. Hydro reviews the cost of supply and the anticipated additional revenue. Where the appropriate return exists the service is provided. In some instances the industrial project pays the additional cost.

(g) **Rerouting of Existing Lines in Critical Locations (Land Use Consultant)**

As outlined in this report, the transmission lines in the existing corridor are a major presence with ongoing land use and social impacts. Although some of these impacts would be reduced by adjustments and refinements in relocating the new 5L46 line, there remain a number of critical areas where selective relocation of existing lines should be considered by B.C. Hydro. If technically feasible and not cost prohibitive, these relocations would be a means of further mitigating against ongoing impacts and providing benefits by means of enhancing the development potential of these lands. The critical areas identified include:

(1) **Village of Pemberton** - consider relocation of 2L2 and substation and release of the 2L2 ROW in addition to 2L1 and its ROW as planned. Benefits would include:

(a) elimination of the presence of the line through the heart of the community;

(b) making available land suitable for infill development above flood plain, which is in short supply;

(c) infill development would be cost effective for municipality to service, thereby contributing to Pemberton's limited taxable assessment base.

(2) **Resort Municipality of Whistler** - consider relocation of 2L2 and 5L42 west of Alta Lake to the upper bench area adjacent to the proposed 5L46 route. Benefits would include:

(a) reduction of visual impact of these lines in this area;

(b) making available land suitable for development.

(3) **Area along Highway 99 South of Whistler** - in the existing corridor in the south section of the Municipality of Whistler (west of Alpha Lake to Brandywine Falls Provincial Park), 2L1 and 2L2 parallel Highway 99 and are prominent visual features at the southern entry to Whistler. Although removal of 2L1 in favour of the 5L46 realignment would be of some benefit in reducing the existing visual impact, this benefit would be offset in large measure by the continuing presence of 2L2.

Consideration should therefore be given to relocating 2L2 adjacent to the 5L46 route. In addition to the visual improvements and associated tourism benefits, an added advantage would be making available suitable valley bottom development land north of Brandywine Falls Provincial Park. This land is within the Resort Municipality and may be contemplated for various forms of urban development at some time in the future - likely in the longer term beyond a ten year horizon.

B.C. Hydro Response

(1) **Village of Pemberton**

B.C. Hydro recognizes the visual impact of 2L1 and 2L2 on the south approach to Pemberton and within the village. As part of this project it is proposed to remove 2L1 from the north side of the Lillooet River valley south to Tisdall and to replace it with 5L46 on an alignment east of the village and the highway, leaving 2L2 in its present location.

From a historical perspective the right-of-way for the transmission lines predated the construction of the Signal Hill School. Since this project now affords the opportunity to move 2L1 from this location adjacent to the school, it is appropriate to do so. In like manner, 2L2 would be relocated at some point in the future should the opportunity present itself. However, 2L2 is designated to be the main feed to the Pemberton substation which is within the village. It is not planned at this time to relocate 2L2 or the substation.

(2) **Resort Municipality of Whistler**

B.C. Hydro recognizes the value of the land within the ROWs for 5L42 and 2L2 west of Alta Lake, and the visual impact that these lines and ROW present when viewed from the east. The land in this area is owned by B.C. Rail and other private owners.

It is B.C. Hydro's policy to move transmission lines off private land to create a benefit for the owner only if the owner receiving the benefit contributes substantially to the cost. In the situation at Alta Lake it would require the agreement of three parties to move the lines. If the RMOW established such zoning for these lands as to make it attractive

to B.C. Rail to recover the costs of their share of moving the transmission lines and development costs, then B.C. Rail would probably be interested in having the lines moved.

B.C. Hydro proposes to take no action at this time other than to plan the location of 5L46 on the west side of Alta Lake to accommodate 5L42 and 2L2 if they are moved at a later date, and to await action by the RMOW and the land owners. However, it should be noted that an opportunity is presented by this project to relocate 2L2 very cheaply if the route through Whistler is used. This could be done by connecting the existing woodpole section of 2L1 west of Alta Lake into 2L2 and removing 2L2 from its ROW. This would require that 5L46 be located on new ROW in this section. This opportunity would disappear if the woodpole section of 2L1 is removed to accomodate 5L46 on its ROW, or if Whistler is bypassed and 2L1 is retained south of Rainbow substation to serve Whistler. B.C. Hydro would cooperate with RMOW and the property owners to pursue this opportunity further, if they desire.

(3) **Highway 99 south of Whistler**

B.C. Hydro recognizes the growing international stature of Whistler as a resort community and the effort and investment that have been made there by Government, the community and investors. There would be significant aesthetic benefits to Whistler if the southern approach to Whistler were made more consistent with the high quality natural theme reflected in the planning and development of the resort.

B.C. Hydro therefore proposes, as part of this project, and subject to the agreement of the RMOW, Ministry of Parks, Ministry of Forests, and Ministry of Crown Lands, to plan for relocation of 2L2 adjacent to 5L46 from Function Junction to Daisy Lake, with the relocation to be undertaken at such time in the future as the present 2L2 is replaced.

(h) **Ongoing Operation and Maintenance (Land Use Consultant)**

There are two important considerations with respect to ongoing operation and maintenance of the transmission line. First, compatible uses of the transmission right-of-way should be examined. These uses may include:

(1) cultivation of Christmas trees by interested local groups or individuals;

(2) harvesting of berries and other wild foods from the right-of-way. These are not only traditional activities of Indian Bands from throughout the study area, but are also looked upon as possible commercial venture by some of those Bands; and

(3) recreational use of the ROW. Horseback riding, hiking and other recreational activities are examples of compatible uses.

An issue which is closely related to compatible uses of the right-of-way is the suppression of vegetation. Careful attention should be paid to the application of herbicides and defoliants. In many cases, particularly where harvesting of berries and wild foods is contemplated, selective hand application and/or injection techniques should be practiced.

A second important consideration with respect to ongoing operation and maintenance of the transmission line is economic benefits to local communities which may be realized from these activities. In order to maximize these benefits, the following steps should be taken:

(1) encourage local hiring of maintenance crews for slashing, vegetation control, etc.; and

(2) encourage local purchasing of required materials and supplies (e.g. brushing equipment, etc.).

B.C. Hydro Response

B.C. Hydro encourages use of the ROW for cultivation of Christmas trees, berries, or other low vegetation. However B.C. Hydro is usually not the owner of the land. It usually holds an easement for the ROW from the Crown or a private owner. The Crown or the private owner must agree first to the proposed activity and a lease obtained.

B.C. Hydro wants to identify where wild foods are gathered on its ROWs and, on request, will remove these areas from any vegetation management program using herbicide. B.C. Hydro had reduced its use of herbicide for vegetation management by 90% over the last 10 years and proposes to seek new methods to reduce still further. B.C. Hydro's goal is to eliminate its dependence on herbicides for vegetation management.

Where B.C. Hydro holds an easement for a ROW on private land it has no authority to encourage recreation. B.C. Hydro is pleased to cooperate where groups seek to establish recreation trails on ROW on Crown land.

B.C. Hydro continues to work to develop local expertise in ROW maintenance and is pleased to contract with any group qualified to undertake the work, and with due cognisance of the public tendering requirements specified by legislation.

(i) **Heritage Survey of Access Roads (Heritage Consultant)**

It is strongly recommended that routes for new access roads in areas of high heritage potential or with many recorded sites be subjected to a heritage inventory prior to construction.

B.C. Hydro Response

B.C. Hydro will undertake a survey in such areas.

REFERENCES

B.C. Hydro Transmission Engineering Division, Kelly Lake-Cheekye 500 kV Technical Report, March, 1991.

Bussey, Jean, Heritage Resource Update, Proposed Kelly Lake/Cheekye 500 kV Transmission Line, March 1990.

Juan de Fuca Consultants, Recreation and Visual Assessments, Kelly Lake-Cheekye 500 kV Transmission Line, August 1990.

Smith, G.M., Fisheries Values and Potential Construction Impacts of the Kelly Lake-Cheekye Transmission Line Project, March 1990.

Synergistics Ltd., Kelly Lake-Cheekye Substation Second 500 kV Transmission Line Public Consultation Report, Phase I and II, March 1991.

Talisman Land Resource Consultants, Kelly Lake/Cheekye 500 kV Transmission Line, Resource Assessments (Terrain, Agriculture, Vegetation and Forestry, Wildlife). January 1991.

Urban Systems Ltd., Kelly Lake-Cheekye 500 kV Transmission Line Environmental Studies, Land Use/ Socioeconomic Component, March 1991.